# The Only Cause of Disease

***Healing by Reversing Pathology***

**THOMAS E. LEVY, MD, JD**

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**THOMAS E. LEVY, MD, JD**

MedFox PUBLISHING

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Dedicated to Linus Pauling, PhD,
who established the principles of
Orthomolecular Medicine, with the
reversibility of all disease by the
restitution of vitamin, mineral, and
other nutrient depletions.

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# Table of Contents


17 Foreword by Dr. Richard Cheng
***A Foundational Work for the Healing Arts***

19 Foreword by Dr. Ron Hunninghake
***Dr. Thomas Levy: Mapping the Nutrient Terrains of Healing with Gumption and Precision***

23 Introduction
***Unable to Deny What I've Seen with My Own Eyes***

SECTION ONE
*The Biochemistry of Disease* *27*

29 Chapter 1
***Basics of Health Chemistry***

Redox Biology: The Chemistry of Life . . . . . 29
Oxidation Always Impedes Biological Function . . . 30
Pro-oxidants (Toxins) Always Cause Oxidation. . . . . 31
Antioxidants are Antitoxins . . . . . 34
Primary Factors Promoting Chronic Disease . . . . . 35
The Determinants of Disease Manifestations . . . . . 37
The Empowering Conclusion: Toxins Cause All Disease . . . . . 37
Three Main Toxin Sources . . . . . 39
Recap. . . . . 40

41 Chapter 2
***The Relationship Between Pathogens and Disease***

Primary Source of Intracellular Biomolecule Oxidation . . . . . 41
Pathogen Physiology . . . . . 42
Pathogen Presentations . . . . . 44
*Focal Infections and Diseases. . . . . 49*
*Chronic Apical Periodontitis (CAP) . . . . . 52*
*Root Canal-Treated Teeth . . . . . 55*
*Cavitational Osteonecrosis . . . . . 60*
*Chronically Infected Tonsils. . . . . 65*
Recap. . . . . 71

Chapter 3
73 ***Disease-Causing Nutrients***

Too Much of a Good Thing . . . . . 73
The Danger of Excess Calcium Intake . . . . . .74
*Cellular Calcium Excess Underlies All Disease. . 74*
*Calcium and Oxidative Stress . . . . . .76*
*Five Common Calcium Myths . . . . . 82*
Copper and Iron: The Toxic Twins . . . . . 84
*Metallic iron filings in the food . . . . . 96*
The Toxicity of Poor Digestion . . . . . 106
*Food Combining . . . . . .107*
*Added Nutrition. . . . . 110*
Recap. . . . . .111

Chapter 4
113 ***Spike Protein: The Unsuspected Toxin***

A Pandemic of Induced Sickness and Death . . . . . 113
Spike Protein Physiology . . . . . 115
Why Spike Protein Persists . . . . . .122
D-dimer Levels . . . . . .128
Therapeutic Agents and Their Mechanisms . . . . . .133
A Simple Chronic COVID Cure? . . . . . .138
Recap. . . . . 140

Chapter 5
143 ***How Toxins Cause Heart Failure***

General Heart Assessment . . . . . .143
Heart Failure Pathophysiology . . . . . .144
Toxins and the Heart . . . . . .147
*Lead: . . . . . .147*
*Copper: . . . . . .148*
*Iron: . . . . . .149*
*Mercury: . . . . . 151*
*Aluminum: . . . . . .153*
*Cobalt/Chromium: . . . . . .153*
*Cadmium: . . . . . .154*
*Gold/Silver: . . . . . .154*

*Chemotherapy:* . . . . . *155*
*COVID Spike Protein:* . . . . . *155*
Spike Protein, Heart Block, and Pilots . . . . . 163
Spike Protein and Blood Clotting . . . . . 170
ATP Physiology and Cardiomyopathy . . . . . 173
Recap. . . . . 181

183 Chapter 6
***How Toxins Cause Coronary Artery Disease***

Relationship Between Coronary Artery Disease and Scurvy . . . . . 183
Inflammation and CAD . . . . . 184
CAD Pathophysiology. . . . . 185
Chronic Pathogen Colonization Causes Atherosclerosis . . . . . 187
Atherosclerosis, the Non-Healing Wound. . . . . 193
Recap. . . . . 195

197 Chapter 7
***How Toxins Cause Cancer***

Toxic Origins of Cancer . . . . . 197
Redox Biology and Toxins . . . . . 198
Breast Cancer Pathophysiology. . . . . 200
Infected Teeth—The Hidden Pandemic . . . . . 204
Chronic Disease and Chronic Pathogen Colonization . . . . . 206
Recap. . . . . 208

211 Chapter 8
***How Toxins Cause Diabetes and Dementia***

The Common Cause . . . . . 211
Pathophysiology of Diabetes Mellitus (DM) . . . . . 213
Diabetes Mellitus Results from an Epigenetic Defect. . . . . 216
Dementia and Nervous System Disease . . . . . 218
Recap. . . . . 219

SECTION TWO
*The Disease Resolution Toolbox* 221

223 Chapter 9
***How Antioxidants Neutralize Oxidative Stress***

The Vital Role of Electron Flow . . . . . 223
The Source of All New Electrons . . . . . 229
ORAC—A Misleading Test . . . . . 231
Recap. . . . . 233

235 Chapter 10
***Important Modulators of Oxidative Stress***

Major Players Determining Intracellular Oxidative Stress . . . . . 235
Intracellular Calcium . . . . . 236
Intracellular Magnesium . . . . . 237
Intracellular Vitamin C. . . . . 237
Intracellular Glutathione (GSH) . . . . . 238
Intracellular Adenosine Triphosphate (ATP). . . . . 239
Critical Hormone Impact on Cellular Oxidative Status . . . . . 241
*Sex hormones—Estrogen. . . . . 241*
*Sex hormones—Testosterone . . . . . 243*
*Thyroid hormone. . . . . 244*
*Cortisol (Hydrocortisone) . . . . . 245*
*Insulin . . . . . 248*
Recap. . . . . 250

251 Chapter 11
***Optimizing the Immune System***

The One Function of the Immune System. . . . . 251
Understanding and Reducing Inflammation. . . . . 252
Vitamin C and Cortisol: Synergistic Partners . . . . . 253
The Acute Immune Response. . . . . 256
Cortisol Physiology . . . . . 257
Vitamin C-Cortisol Synergy: Supporting Research. . . . . 265
Vitamin C and Cortisol Safety. . . . . 268
Recap. . . . . 273

275 Chapter 12
***Vitamin C: The Premier Antioxidant***

Supremacy in Restoring Oxidized Biomolecules. . 275
Unique Antioxidant Abilities . . . . . 276
Important Historical Context . . . . . 277
Significant Vitamin C Research Findings. . . . . 279
*Anti-Pathogen . . . . . 279*
*Antitoxin . . . . . 282*
Clinical Application Factors. . . . . 283
Dose . . . . . 284
Route of Administration. . . . . 284
Rate of Administration . . . . . 286
Frequency of Administration . . . . . 289
Duration of Administration . . . . . 290
Form of Vitamin C . . . . . 290
Vitamin C and Synergistic Therapies 292
Multi-C Protocol. . . . . 293
Mop-Up IVC . . . . . 295
Vitamin C's Incredible Safety . . . . . 298
Vitamin C and Kidney Stones . . . . . 300
Vitamin C and G6PD Deficiency . . . . 304
Vitamin C and Immunosuppressive Drugs . . . . . 306
Recap. . . . . 308

309 Chapter 13
***Magnesium: The Most Vital Supplement***

Most Adults Have a Magnesium Deficiency . . . . . 309
Magnesium Physiology . . . . . 310
Cellular Electrical Disorders . . . . . 313
*Heart Cells and Arrhythmias . . . . . 313*
*COVID Spike Protein and Sudden Death . . . . 316*
*Nerve Cells and Seizures . . . . . 318*
Magnesium and Poisonings. . . . . 320
Optimizing Magnesium Levels . . . . . 322
Recap. . . . . 327

329 Chapter 14
***Niacin, Vitamin C, and the Central Nervous System***

Toxicity Concerns Frequently Result in Severe Underdosing of Essential Nutrients . . . . . 329
Vitamins: Safe and Beneficial . . . . . 330
Niacin: Nomenclature and Physiology . . . . . 333
Niacin Supplementation . . . . . 335
Niacin, Health, and Schizophrenia . . . . . 336
Recap . . . . . 349

351 Chapter 15
***Methylene Blue: Antioxidant Extraordinaire***

Amazing Exception to the Rule . . . . . 351
VC and MB: Great Antioxidant Partners . . . . . 353
Methylene Blue: A Brief History . . . . . 355
Extraordinary Properties of MB . . . . . 356
Ideal Shock Therapy . . . . . 358
MB, Pathogens, and Photodynamic Therapy (PDT) 363
MB and Cancer . . . . . 366
MB: Safety and Dosing . . . . . 367
Recap . . . . . 369

SECTION THREE
*Designing Optimal Treatment Protocols 371*

373 Chapter 16
***Foundational Treatment Principles & Modalities***

Treatment Protocol Objectives . . . . . 373
First Step: Elimination of Toxin Exposures . . . . . 375
Optimal Treatment Protocols . . . . . 376
Bio-Oxidative Therapies . . . . . 376
*Vitamin C . . . . . 377*
*Hydrogen Peroxide (HP) . . . . . 384*
*Ozone . . . . . 392*
*Ultraviolet Blood Irradiation . . . . . 394*
*Hyperbaric Oxygen Therapy . . . . . 395*
Inhalation Medicine . . . . . 396
*HP Nebulization Guidelines . . . . . 398*
Persistent Spike Protein (PSP) Treatment . . . . . 400

Chapter 17
403 ***Treating Chronic Pathogen Colonization (CPC)***

Treatment Overview . . . . . 403
CPC Pathophysiology and Treatment . . . . . 404
*Probiotics . . . . . 408*
*Tongue Hygiene. . . . . 408*
*Nebulization . . . . . 411*
*Common Oral CPC infections. . . . . 413*
*Personal Experience. . . . . 414*
*Choice of Dentist. . . . . 415*
*Traditional versus Biological Dentistry . . . . . 416*

Chapter 18
419 ***Treating Cardiomyopathy and Coronary Heart Disease***

Cardiomyopathy Treatment Overview. . . . . 419
Cardiomyopathy Treatment Protocols. . . . . 420
*Toxin Elimination: . . . . . 420*
*Restoring Cellular Energy Production: . . . . . 424*
Coronary Artery Disease Treatment Overview . . . 426
*Resolving Coronary Atherosclerosis . . . . . 426*

Chapter 19
431 ***Optimal Cancer Treatment***

Treatment Overview . . . . . 431
Primary Toxin Sources . . . . . 432
Constructing a Treatment Protocol. . . . . 433
Breast Cancer Treatment. . . . . 435
Uninformed Consent?. . . . . 436

Chapter 20
437 ***Treating Diabetes and Dementia***

Underlying Pathology . . . . . 437
Specific Treatment Considerations . . . . . 438

441 Chapter 21
***Treating Osteoporosis***

Treatment Overview . . . . . .441
Osteoporosis: Focal Scurvy of the Bones . . . . . 442
Osteoporosis Reversal . . . . . .444
*Vitamin C . . . . . 444*
*Magnesium . . . . . 444*
*Vitamin K . . . . . 444*
*Vitamin D . . . . . 445*
*Essential Fatty Acids . . . . . 445*
*Estrogen . . . . . 445*
*Testosterone. . . . . 445*
*Thyroid Hormone . . . . . 446*
Practical Suggestions for Calcium Intake . . . . . 446

SECTION FOUR
*Appendices, Index, and References* *451*

453 Appendix A
***Baseline Supplementation Protocol***

455 Appendix B
***Unknown and Little-Known Facts to Take Away from this Book***

469 Appendix C
***Surgical Protocol for Extractions of Infected Teeth and Cavitation Surgery***

477 Appendix D
***Resources***

480 Topic
***Index***

536 Cited
***References***

## Foreword by Dr. Richard Cheng

# A Foundational Work for the Healing Arts

In a world overwhelmed by chronic disease and medical complexity, *The Only Cause of Disease* is a lighthouse cutting through the fog of confusion. Dr. Thomas Levy has done what few in modern medicine dare to do: strip disease down to its root molecular cause—**intracellular oxidation**—and build a clear, science-based path to true healing.

As a physician who has spent decades in both clinical practice and scientific inquiry, I find Dr. Levy's message both **revolutionary and refreshingly logical**. He reframes our understanding of disease—not as a set of symptoms to manage or suppress—but as the **biochemical manifestation of toxin overload, oxidative stress, nutrient depletion, and immune disruption**. His central thesis is simple yet profound: **oxidative stress is not just associated with disease—it *is* the disease**.

Through this book, Dr. Levy guides readers chapter by chapter into the **redox-based foundation of health**. He reintroduces us to forgotten heroes, such as vitamin C, magnesium, niacin, methylene blue, and hydrogen peroxide—not as fringe remedies, but as **essential modulators of cellular vitality and immune defense**. His

detailed exploration of calcium, iron, and copper as "toxic nutrients" is particularly courageous, as it challenges some of the most entrenched myths in nutritional and pharmaceutical dogma.

What sets this book apart is not just its clarity of science but its **clinical urgency**. Whether discussing heart failure, breast cancer, schizophrenia, or Persistent Spike Protein (PSP) Syndrome, Dr. Levy doesn't stop at theory—he delivers **actionable, evidence-based protocols** that empower patients and clinicians alike. He revives the core ethos of real medicine: to understand the cause, eliminate the toxin, restore the terrain, and support the body's innate ability to heal.

Perhaps most importantly, this book serves as a **call to courage**. Courage for patients to ask more profound questions. Courage for physicians to revisit forgotten truths. And courage for all of us to move beyond symptom suppression toward **root-cause resolution**.

As someone deeply committed to **orthomolecular, integrative, and metabolic medicine**, I believe this book is not just timely—it is essential. *The Only Cause of Disease* will stand as a foundational text for the coming era of **regenerative, redox-informed healthcare**. Every chapter reflects Dr. Levy's unwavering commitment to truth, integrity, and the art of healing.

I am honored to introduce this work, and I encourage you not only to read it, but also to live it, apply it, and share it. Because when we eliminate toxins, restore nutrients, and rebalance the body's redox state, we don't just treat disease. We **reverse it**.

**Richard Z. Cheng, MD, PhD**
Editor-in-Chief, Orthomolecular
Medicine News Service
Founder, Cheng Integrative Health
Co-founder, Low Carb Medicine Alliance of China

Foreword by Dr. Ron Hunninghake

# Dr. Thomas Levy: Mapping the Nutrient Terrains of Healing with Gumption and Precision

In an age where chronic illness proliferates despite technological sophistication, there remain few clinicians who dare ask not only what is broken—but why.

Dr. Thomas E. Levy, MD, JD, is one of those rare figures who doesn't treat medicine as a mechanical fix, but as a dynamic process of restoring nutritional terrain. With thirteen influential books spanning clinical science, nutrition, toxicology, and emotional wellness, Dr. Levy has spent decades charting the metabolic map beneath disease—and doing so with extraordinary gumption and precision.

His work is not defined by convention, but by clarity. Where others conform to protocols, Dr. Levy investigates the ***biochemical whispers*** beneath pathology—the signals hidden in nutrient imbalance, oxidation, and molecular overload. Through his books, one sees the body not as a battleground but as a terrain—a symphony of functional systems modulated by nutrients like ***vitamin C***, ***magnesium***, ***vitamin D***, and yes, even cortisol—a misunderstood

hormone whose role in healing is often overshadowed by fear of side effects.

Carefully tackling this very nuanced subject of "the proper clinical use of cortisol," Dr. Levy reminds and enlightens us with the startling fact that cortisol is not the enemy! It is a ***natural steroid***, secreted in response to oxidative stress, and essential for preserving terrain integrity during illness. When used thoughtfully in physiological doses, ***hydrocortisone (bioidentical to cortisol)*** supports adrenal function, stabilizes immunity, and reduces chronic inflammation without causing the harm attributed to synthetic corticosteroids. He points out that the real danger arises not from cortisol itself, but from ***overuse of synthetic surrogates*** like prednisone and dexamethasone—long-acting sledgehammers that obscure the elegance of natural endocrine modulation.

This insight into cortisol typifies Dr. Levy's approach. He doesn't discard conventional tools—he refines them. His "nutritional gumption" comes from discernment, not rebellion. In his treatment paradigm, ***restoring deficient hormones*** and nutrients is not indulgence—it is logic. Much like his emphasis on ***vitamin C as a redox amplifier, magnesium as a mitochondrial stabilizer, or vitamin D as a rhythm modulator***, cortisol plays its part in terrain coherence when handled with respect, not repression.

This book, which I consider his masterpiece, is the culmination of a dazzling body of nutritional gems, books that have built the sturdy foundation precisely for this book! I believe that I would be remiss to the reader if I didn't make a few allusions to this treasure chest of knowledge, if not only to whet the prospective reader's appetite for what he or she will be gaining by devouring *The Only Cause of Disease*, but to

actually ***taste*** the "whole food's goodness" of sound nutritional logic.

*Curing the Incurable* champions high-dose vitamin C not just as an immune booster, but as a molecular intervention into oxidative injury. *GSH: Master Defender* highlights glutathione's role in detoxification and immune modulation, linking antioxidant terrain to viral resilience. *Death by Calcium* dismantles the myth of calcium supplementation, exposing how excess calcium calcifies soft tissues, blocks thyroid signaling, and ignites vascular inflammation. *The Toxic Tooth* and *Hidden Epidemic* uncover the silent impact of the oral terrain—how root canals and jaw infections can degrade heart, brain, and immune function. Every book is a terrain map, guiding the reader from biochemical fog into restorative clarity.

Even his exploration of mental terrain in *Living in Your Right Mind* reflects his multidimensional vision. There, he links emotional tone and neurochemical balance, echoing the symbolic truth that healing demands coherence not only in molecules but in meaning. It's a text that affirms Dr. Levy as more than a biochemical specialist—he is a systems thinker, a relational clinician, and a philosopher of wellness.

His clinical courage is matched by intellectual precision. Long before "terrain theory" found public traction, Dr. Levy was practicing it—not as a trend, but as a method. He recognized that the body is governed by ***invisible regulators***: nutrients, minerals, redox potential, microbial signaling, and cellular memory. When these regulators are balanced…healing flows. When distorted by toxicity, deficiency, excess, or emotional disruption…illness manifests.

In our collaborations, I've experienced this directly. My work leans into the detective work of direct patient care, discerning the symptomatic meaning and symbolic life situation overlays—where physiology meets narrative. Dr. Levy's work provides structural scaffolding for my work as a clinician: molecular clarity, nutrient specificity, and biochemical accountability. Together, our dialogue mirrors the ***left and right hemispheres of medical integration***: his disciplined insight harmonizing with my intuitive resonance.

What I most admire about Dr. Levy is his refusal to settle. He does not champion blanket cures or simplistic claims. His gumption lies in nuance—in choosing the long road of nutrient AND terrain restoration over the short path of symptom suppression. Whether addressing heavy metal toxicity, calcification, infection, fatigue, or oxidative chaos, his lens remains consistent: support the terrain, restore the signal, replenish the root, and treat the cause!

This foreword celebrates his work not merely as literature, but as a ***movement***! A clarion call to honor the body's natural intelligence and give clinicians the tools to ***see beneath the symptom***. Whether it's cortisol dosage, vitamin C protocols, mineral balancing, or oral terrain awareness, Dr. Levy's legacy is one of radical discernment. And his compass always points toward greater biological coherence…and the health that is truly beyond the management of symptoms.

May this latest contribution strengthen that legacy and serve as a terrain map for all who seek to heal with wisdom, integrity, and yes—gumption.

**— Ron Hunninghake, MD**
Chief Medical Officer, Riordan Clinic

*One person can make a difference, and everyone should try.*
John F. Kennedy

# Unable to Deny What I've Seen with My Own Eyes

Many books and extensive medical literature analyze and discuss the causes of various diseases, along with the treatments deemed by mainstream medicine to be the most effective clinical therapies for those conditions. Some of the information is valid, but far more is misleading and, frankly, incorrect. This is mainly because medicine evolves far more through tradition and the financial benefits of the major players in the medical industry than it does through the emergence of revolutionary new therapies or new insights into the nature of disease. Pharmaceutical companies, healthcare systems, hospitals, and physicians, along with other healthcare professionals, diligently resist change unless a new treatment can yield even greater financial returns in its application.

Roughly 30 years ago, I was practicing adult cardiology in Colorado Springs, Colorado. It was a satisfying practice, as it offered an enjoyable day-to-day experience for me, and I felt that I was positively impacting the lives of the patients who came to see me. However, I slowly began having nagging doubts about whether

my entire life's work was to practice cardiology until I was ready to retire. Precisely what I should be doing eluded me, but the internal uncertainty as to my path and destiny steadily grew.

In July 1993, I had the opportunity to meet and spend some time with Dr. Hal Huggins at an Extraordinary Science Conference sponsored by the International Tesla Society. A conference that examined non-traditional views of physics, science, and biology, both he and I enjoyed interacting with the participants of such an event, as well as each other. Dr. Huggins, as I later learned, was the leading biological dentist in the world, meaning that he fully understood the interplay between internal medicine and dental medicine. I had just recently read his book on the toxicity of mercury amalgam dental fillings. I knew that I had a substantial number of them in my mouth at the time, and I was interested in hearing what Dr. Huggins might recommend that I do, even though I was 42 years old and feeling perfectly healthy at the time. He simply smiled and said that I should get the amalgams removed "only if you want to remain healthy."

About six months later, my perfect health completely disappeared, and I developed pounding headaches with severely elevated blood pressure. High blood pressure is one of the most common conditions treated by cardiologists, so I thought I already knew all that I needed to know about this condition. I was just hoping that I could get good control of my blood pressure on one medication rather than many. I never thought for a moment that I would be learning what really causes high blood pressure and how to alleviate those causes, rather than follow my established "cookbook" approach to the treatment and control of this condition with pharmaceutical agents.

It was about that time that "Dr. Levy," the cardiologist, felt he should talk to Dr. Huggins, the dentist, about my new high blood pressure! Dr. Huggins was very clear: "Your mercury fillings need to come out." But I wasn't prepared for his following statement: "And

that root canal you have needs to be properly extracted as well." My only reply was a very weak: "Really??!!" I was emotionally prepared for a bunch of new fillings, but I never imagined that I would "need" to have a tooth extraction as well. Yet I also knew the moment I made that utterance that Dr. Huggins was someone I could trust, even though my understanding of how my mouth was impacting my health was only in its earliest stages.

What happened next was hard to believe. I had previously just "felt" that I was in good health and feeling well. I quickly realized that a patient adjusts to whatever level of health he has and often ends up considering it normal, especially when it has been that way for a long time, as long as it has not been too grossly abnormal.

Following the removal of my mercury fillings and the root canal, my energy skyrocketed, and my clarity of thought improved just as dramatically. The severely elevated blood pressure quickly dropped to near normal levels, and I never had another headache. Many other "minor" symptoms disappeared or lessened as well, and I had no doubt that my body greatly appreciated losing the mercury and the root canal.

Shortly afterwards, Dr. Huggins asked me to be a medical consultant at his clinic, which I eagerly accepted as I shuttered my cardiology practice for good. I knew that I had a lot to learn from Dr. Huggins, and I also knew I would never learn it anywhere else. One day, a little wheelchair-bound lady with a neurological condition was getting extensive dental work at the Huggins clinic. After many hours of dental work, including extractions, she began to become more and more animated toward the end of her treatments. She even told her caregiver that she was feeling so good, she wanted to find a great Colorado Springs restaurant for dinner, even though she only had one side of her mouth left upon which to chew.

Dr. Huggins entered the dental operatory at that time, and I asked him, "What's going on? How is this lady becoming so energized while undergoing such extensive and invasive dental work?"

Dr. Huggins pointed to her IV and said, "That's why." And before I had the chance to ask, he added: "She has been receiving a steady infusion of vitamin C before, during, and after her dental work at a total dose of 50 grams (50,000 mg)." Well, as the British might have said, I was gobsmacked, literally stunned beyond words.

And it was literally at that precise point that my life changed forever. I was incapable of denying what my eyes had witnessed. From that point on, I needed to know everything there was to know about vitamin C.

Thirty years and 13 books later (this is the 14th), I still marvel at the genius of Dr. Huggins. As the first true biological dentist on the planet (in my opinion), he linked together what should always have been self-evident but remains largely unaccepted and unrealized even today: Nothing is more connected to the rest of the body than the mouth. Neither is ever chronically sick in isolation from the other.

Of particular interest to me as a cardiologist, the medical and dental literature led me to the incontrovertible conclusion that nearly all heart attacks (and breast cancers) are due to oral pathogens that manage to reach and colonize in breast tissue and in the inner linings of the coronary arteries. However, the cardiologist or internist never consults the dentist, and the dentist only rarely refers patients to a cardiologist or medical doctor. The health of the public will never be well-served until this "specialization isolation" finally disappears.

> **As it turns out, all disease is excess oxidation, and all excess oxidation is caused by toxins, usually from pathogens.**

Sometimes in biology and science, simplicity can emerge. This book will endeavor to validate this assertion.

**Thomas E. Levy, MD, JD**

# Section One

## The Biochemistry of Disease

## Chapter 1

*If everyone is thinking alike, then somebody isn't thinking.*
George S Patton

# Basics of Health Chemistry

## Redox Biology: The Chemistry of Life

All health, sickness, and death events happen at the biomolecular level as energy flows or is impaired in its flow from one molecule to another through the exchange of electrons. This energy flow refers to the movement of electrons within cells, commonly known as reduction-oxidation (redox) biology. Reduction occurs when an oxidized molecule gains one or more electrons, thereby returning to its normal chemical state. Oxidation refers to the loss of electrons. Redox biology effectively describes biological health as it relates directly to the degree of oxidation (the loss of electrons) versus reduction (the restoration of electrons) in and among the biomolecules throughout the body. This has led directly to the frequent use of the concept of "oxidative stress" as the premier biomarker of all chronic diseases, which is now frequently discussed in the medical and scientific literature.[1] In other words, reduction and oxidation refer to the movement of electrons between molecules. When a normal biomolecule loses or gives up electrons, it becomes oxidized. When an oxidized biomolecule can regain the lost electrons, it becomes reduced and returns to its normal

biochemical state.[2] In a nutshell, oxidation is the opposite of reduction.

Technically, the states of reduction and oxidation can also be viewed in terms of the status of hydrogen and oxygen. Reduction refers to the gain of hydrogen and the loss of oxygen, while oxidation refers to the loss of hydrogen and the gain of oxygen. However, it is simplest to think of redox biology in terms of electron movement and whether a given biomolecule is electron-depleted (oxidized) or electron-saturated (reduced).

## Oxidation Always Impedes Biological Function

All body tissues are composed of a wide array of biomolecules, including sugars, fats, proteins, enzymes, structural molecules, DNA, and RNA. Additionally, all these biomolecules have specific functions in their interplay with one another, both inside and outside the cells. The essence of health depends on how well these molecules can chemically interact with one another. When there are no impediments to these interactions, biological function is optimized, and overall health in the body is also optimized.

When any biomolecule is in an oxidized, electron-depleted state, it becomes either completely incapable of having its normal chemical interactions with other biomolecules (inactivation) or those interactions become severely impaired, as with an enzyme that is partially suppressed in its ability to participate in and accelerate a chemical reaction. In such an oxidized state, that biomolecule is now officially "diseased." When an oxidized biomolecule reacquires electron(s) so that it is brought back to the reduced, chemically stable state, it is no longer diseased and officially "normal" again. When excess oxidative stress is advanced, and a significant number of biomolecules are in the oxidized state, normal cellular metabolic function is further impaired or prevented. These non-functioning biomolecules not only lose their ability to function but also occupy space, which can effectively block or at least impede

the normal chemical and metabolic interactions of functioning biomolecules with other functioning biomolecules.

Beyond being in a state of oxidation or reduction, biomolecules have no other form of existence. As such, there is no further "affliction" that biomolecules can possess. An oxidized biomolecule is diseased, and a reduced biomolecule is normal. Whether in the brain of an Alzheimer's patient or the lining of the coronary arteries of a patient with atherosclerosis and heart disease, biomolecules are either in an oxidized or a reduced state. This electron status is what defines all diseases.

**The essence of health depends on how well these molecules can chemically interact with one another.**

**The only pathology, or "disease," sustained by a single biomolecule is whether it is oxidized. Therefore, excess oxidation among many biomolecules, or increased oxidative stress, does not cause pathology in the cells and tissues; it IS the disease.**

## Pro-oxidants (Toxins) Always Cause Oxidation

What is a pro-oxidant? It is any molecule that oxidizes biomolecules, and various names identify them:

- **Pro-oxidants =**
- **Free Radicals =**
- **Reactive Oxygen Species (ROS) =**
- **Oxidizing Agents =**
- **Poisons =**
- **Toxins**

It is essential to recognize that these words and phrases are all synonyms in terms of their contribution to increasing oxidative stress, as evidenced by a review of the scientific literature.

They are all ***oxidizing agents***, meaning they pull electrons away from normal, reduced biomolecules, while restoring electron balance to themselves, assuming a more stable biochemical state that never seeks to donate those electrons back to another electron-depleted molecule.

**Whether in the brain of an Alzheimer's patient or the lining of the coronary arteries of a patient with atherosclerosis and heart disease, biomolecules are either in an oxidized or a reduced state.**

On the other hand, antioxidants, in the right microenvironment, donate electrons to electron-depleted (oxidized) biomolecules. As such, antioxidants are grouped as ***reducing agents***, restoring oxidized biomolecules to their healthy, biologically active state. Vitamin C (ascorbate), the most essential and widespread antioxidant in the body, is a prime example of redox biology and its impact on the body in both health and disease.

In other words, pro-oxidants seek to remove electrons from biomolecules, oxidizing them and leaving them in an electron-depleted state until they can be repaired (reduced) by an antioxidant, such as vitamin C.

A significant portion of contemporary scientific literature is devoted to examining and evaluating the effects of toxins on both acute and chronic diseases. This emphasis is certainly warranted, as the presence and biochemical impact of toxins is truly the etiology of ALL disease. However, one central point about toxins that is repeatedly overlooked or not fully appreciated is that all toxins are pro-oxidant. The terms "pro-oxidant" and "toxin" are often used interchangeably. To summarize and highlight these important points:

- ✓ Antioxidant molecules donate (or restore) electrons to oxidized biomolecules.
- ✓ Pro-oxidant molecules (toxins or poisons) take electrons or cause electrons to be taken away from normal, healthy biomolecules. Unlike antioxidants that "borrow" electrons and then pass them on to other electron-depleted biomolecules, a toxin NEVER returns stolen electrons. Along with the nature of the oxidized biomolecule, this permanent removal of electrons from the "electron pool" inside the cells is what causes the negative clinical impact of a toxin.

Both a toxin and an oxidized antioxidant are depleted of electrons. But their effects in the body are enormously different. This is because the toxin never relinquishes the electrons it steals from a viable biomolecule. Those electrons are permanently lost to the body. Like a toxin, an oxidized antioxidant is also depleted of electrons. However, when it can reacquire the lost electrons, it is ***eager*** to give those electrons up again to an electron-depleted biomolecule, thereby restoring it to its normal status. As such, antioxidants, such as vitamin C, continually promote an ongoing exchange of electrons throughout the body, particularly within cells. This continuous exchange of electrons produces an electron flow inside the cells, which can be measured as a microcurrent. As the microcurrent develops with maximal antioxidant and minimal toxin presence, voltages across the cell membranes (transmembrane voltages) also develop. The healthiest cells have the highest measurable transmembrane voltages. As the cell membranes continuously regulate electrolyte, solute, and nutrient transport vital to the cell's health, its "electrical" status — the health of which is directly correlated with the degree of oxidative stress inside the cell — directly impacts all critical cellular functions.[3-6]

## Antioxidants are Antitoxins

A poison is simply a toxin, nothing more. And while the clinical manifestations of different poisonings can vary widely, the toxic identity of the offending poison means that all the negative impacts of the poisoning are due to the degree and distribution of biomolecules that were poisoned (oxidized). Because of this, the optimal and most effective treatment of any poisoning is the prompt administration of enormous amounts of antioxidants. Vitamin C, as an effective antitoxin for almost every imaginable intoxication or poisoning, has been extensively documented in the medical and scientific literature. However, you might never suspect it by the way cases of clinical poisoning are treated in the emergency room or the local poison control center.[7] To date, no toxin or poison has been identified in the literature against which vitamin C has failed to have an antitoxic effect. Examples of the extensive ability of vitamin C to neutralize, lessen, and even resolve the negative clinical and/or laboratory testing impact of diverse poisonings and intoxications include the following:

**...antioxidants, such as vitamin C, continually promote an ongoing exchange of electrons throughout the body, particularly within cells.**

- ✓ Alcohol (ethanol)[8-9]
- ✓ Barbiturates[10-12]
- ✓ Carbon monoxide[13-14]
- ✓ Endotoxin[15-17]
- ✓ Cocaine[18]
- ✓ Acetaminophen[19]
- ✓ Acetaldehyde[20]
- ✓ Amphetamine[21-23]

- ✓ Benzene[24]
- ✓ Carbon tetrachloride[25-26]
- ✓ Cyanide[27-28]
- ✓ Methanol[29]
- ✓ Nicotine[30-31]
- ✓ Paraquat[32-33]
- ✓ Phencyclidine "PCP"[34]
- ✓ Phenol[35-36]
- ✓ Thallium[37]
- ✓ Mushroom (and other antioxidants)[38-40]
- ✓ Pesticides, multiple types[41-51]
- ✓ Radiation[52-53]
- ✓ Strychnine[54-55]
- ✓ Tetanus[56-58]
- ✓ Mercury[59-60]
- ✓ Lead[61-62]
- ✓ Chromium[63-65]
- ✓ Arsenic[66]
- ✓ Cadmium[67-68]
- ✓ Nickel[69-70]
- ✓ Aluminum[71-72]
- ✓ Venoms [spider, snake][73-76]

## Primary Factors Promoting Chronic Disease

Because excess oxidation is disease, and because all oxidizing agents are toxins, it follows that the factors that cause and promote chronic disease (or chronic excess oxidation) are simply the sources of new toxin exposure for a given individual.

Because of this, the following conditions can be regarded as the most significant instigators of chronic disease:

- ✓ Infections and infectious diseases. Pathogens cause harm due to the toxins they produce.
- ✓ Chronic pathogen colonizations (CPCs) throughout the body, but especially in the oral cavity, nasopharynx, and throat.
- ✓ New external toxin exposures (air, food, water, etc.).
- ✓ Excess ingestion of calcium, iron, and copper.
- ✓ Pre-existing heavy metal accumulations in the organs and tissues.
- ✓ Dietary toxin exposures, especially those resulting from a leaky gut, a pathogen-overgrown microbiome, and excessive putrefaction of food before proper digestion occurs, are often due to poor food combinations.
- ✓ Chronic hormone deficiencies, especially estrogen or testosterone, thyroid hormone, and/or cortisol.

With these toxin sources in mind, it then logically follows that optimal treatment protocols for all chronic diseases should incorporate these principles:

- ✓ Minimizing, if not eliminating, new daily toxin exposures.
- ✓ Neutralizing toxins already present in the body.
- ✓ Chelating, or mobilizing and excreting, toxic metals (such as iron, mercury, and other heavy metals) already present in the body in as nontoxic a manner as possible.
- ✓ Identifying and resolving all chronic infections and/or pathogen colonizations with appropriate measures taken to prevent or minimize the development of new or recurrent infections.

- ✓ Eating a balanced, nutrient-rich diet with emphasis on all the measures necessary to assure optimal digestion.
- ✓ Addressing hormone deficiencies, including the sex hormones, thyroid hormone, and cortisol.

## The Determinants of Disease Manifestations

The primary clinical differences in various diseases relate directly to the unique assemblage of oxidized biomolecules in the affected tissues. The nature of the pathology of any given disease is directly the result of the following characteristics of the biomolecules that are oxidized:

1. TYPE: Which biomolecules are oxidized? (typically many different types, rarely only a few)
2. LOCATION: Where are they present? (cytoplasm, intracellular organelles, extracellular)
3. EXTENT: What is the degree of oxidation? (5% of one type of biomolecule or 50% of another?)
4. TIME: How long has the oxidized state of the affected biomolecules been present (chronicity)

**It is the interrelationships and magnitudes of these four factors of biomolecule oxidation that determine the nature of the disease process and the extent of its clinical manifestations.**

## The Empowering Conclusion: Toxins Cause All Disease

While the concept that every disease arises solely from the oxidation of biomolecules resulting from toxins stealing their electrons may seem like an oversimplification, it is not. What

causes disease is straightforward, as described above. To phrase it more succinctly:

**The excessive oxidation of biomolecules *IS* disease.**

It is often asserted that increased oxidative stress ***causes*** disease. While not entirely inaccurate, it is more accurate to realize that the extent or degree of biomolecule oxidation in a tissue or organ ***is*** the disease itself. The excess oxidation does not impart any further, ill-defined disease or abnormal condition. The disease state is the type, degree, location, and chronicity of excess biomolecule oxidation, nothing more.

What gets complex, however, is finding the best way to restore oxidized biomolecules to their reduced state and keep them in that state to minimize and sometimes even eliminate the related chronic disease. Several protocols can achieve the common goal of lowering bodywide and tissue-specific oxidative stress. Some protocols are much more effective at achieving this goal than others, but it is always important to remain open to new protocols that prove to be more effective. The fact that one medical practitioner can achieve desired clinical outcomes does not mean that it is the only way to achieve this goal.

**The disease state is the type, degree, location, and chronicity of excess biomolecule oxidation, nothing more.**

Many treatment protocols have enormously positive interventions "mixed" in with useless or even ***counterproductive*** measures, which will still result in a net positive impact of the protocol. Furthermore, different patients may exhibit varying clinical responses to identical protocols for various reasons. Because of this, it is always important to be open to modifying even well-established protocols, which reputable clinicians utilize, to meet the individual

patient's needs. Even the best clinicians tend to remain committed to their established practices, which they have honed over many years with various patients.

## Three Main Toxin Sources

While the number of oxidation- and disease-causing toxins is almost limitless, it is important to recognize that most clinical diseases or medical conditions ultimately stem from one or more of the three primary sources of toxins. Certainly, anyone can have a unique toxin exposure that overrides the clinical impact of all their other toxin exposures, such as living next to a heavily polluting chemical factory. In such a situation, minimizing the impact of the three primary toxin sources may have minimal to no significant clinical impact, as long as the individual remains near the factory.

Aside from such unique heavy toxin exposures, most disease results from the impact of infections and heavy metal accumulations. To be more specific, nearly all conditions are secondary to one or more of the following:

- ✓ Sites of chronic pathogen growth, including abscesses and chronic pathogen colonization, in the oral cavity and the immediate surrounding area
- ✓ Persistent spike protein (PSP) syndrome following an unresolved bout of COVID, or most commonly, following COVID vaccination, especially when followed by one or more booster shots
- ✓ Heavy metal accumulations in the organs and other tissues, usually from many years of exposure

These topics will be discussed in great detail in the remainder of the book, along with the recommended ways to lessen or even eliminate their presence and clinical impact in the pursuit of optimal health.

Section Two (Chapters 9 through 15) discusses specific tools that may be used to prevent, treat, or resolve various toxin-initiated diseases. Section Three discusses general treatment protocol principles (Chapter 16) as well as more targeted disease protocols (Chapters 17-21).

## Recap

Redox biology concisely explains the nature of disease as well as the nature of its resolution. The literature frequently refers to the increased oxidative stress associated with all diseases. As it turns out, the oxidative stress does not ***lead*** to disease, but ***is*** the disease itself. The agents that oxidize are commonly known as toxins. Different toxins oxidize different biomolecules, which is why they produce distinct clinical syndromes, even though the ***primary*** damage they inflict is the oxidation of biomolecules. Vitamin C neutralizes a wide range of toxins (listed above).

The electron-depleted nature of a toxin, along with the electron-saturated nature of an antioxidant like vitamin C, is the reason that antioxidants are "natural" antitoxins. The antioxidant can quench the toxin before it causes oxidation, as well as restore the toxin-oxidized biomolecule to its normal state. As the premier antioxidant in the body, vitamin C has also been shown, therapeutically, to be an ideal treatment for toxin poisoning or medication overdose. Magnesium is also crucial for such patients, as it prevents many from developing fatal toxic arrhythmias before the vitamin C has a chance to repair all the newly oxidized biomolecules.

Since toxins cause all disease, a listing of the primary sources of new toxin exposure is provided, along with important considerations for constructing an optimal treatment protocol for any disease.

## Chapter 2

*It is easier to fool people than to convince them that they have been fooled.*
Mark Twain

# The Relationship Between Pathogens and Disease

## Primary Source of Intracellular Biomolecule Oxidation

While it is true that the poliovirus can cause poliomyelitis, the *Clostridium tetani* bacteria can cause tetanus, and the *Corynebacterium diphtheriae* bacteria can cause diphtheria, these pathogens — as well as all others — sicken their hosts by creating increased intracellular biomolecule oxidation (IBO), also known as increased intracellular oxidative stress (IOS). The distinguishing differences between polio, chickenpox, and diphtheria (and all other pathogens) are determined by which tissues or organs are targeted by the toxins the pathogens release. The poliovirus causes IBO in the nerve cells (motor neurons) in the gray matter of the spinal cord; the *Clostridium tetani* bacteria cause IBO in the muscles (especially in the jaw and neck); and the *Corynebacterium diphtheriae* usually causes IBO in the mucous membranes of the nose and throat.

All disease, including that caused by pathogens, is accurately defined as the state of increased IBO or increased IOS. This concept, along with supporting evidence, is presented in more detail in Chapter 1. Understanding it is essential for deriving the maximum benefit from this book. Although the difference is somewhat subtle, this means that increased oxidative stress does not ***cause*** disease, but ***is*** the disease itself. When increased IBO can be restored to normal, or "physiological" levels, the cell is once again normal. Quite simply, then, the primary goal in treating any patient for any condition is to identify all ongoing toxin (pro-oxidant) exposures and to minimize or eliminate those exposures while restoring oxidized biomolecules to their normal, reduced biochemical status.

**Pathogens are the primary sources of new toxin production and exposure in nearly every patient.**

Of course, some patients will have significant additional sources of toxin exposure that must be addressed, but eliminating focal infections and chronic pathogen colonizations must always be a primary goal in any treatment protocol.

## Pathogen Physiology

Defining a pathogen properly requires a functional context. No microbe is absolutely and always a pathogen; under certain conditions, the microbe might be innocuous or even beneficial. On the other hand, all microbes can cause infections and diseases under certain circumstances. ***A pathogen, then, is a microorganism that causes disease in a given setting.*** What determines whether a microbe is a pathogen depends mainly on the general immunocompetence of the host as well as the nature of the local microenvironment (such as acidic or hypoxic) where the microbe is introduced or begins to proliferate.[1-3]

Generally, as a pathogen thrives and grows, the waste products of its metabolism are released as oxidized, toxic byproducts. Some pathogens have been identified as producing specific and highly

potent toxins (exotoxins and endotoxins). Still, even the less well-characterized products of pathogen metabolism are also electron-deficient and seek to oxidize biomolecules, causing a toxic impact on the host.[4-7]

Just as a larger organism regularly eliminates toxic substances through its gastrointestinal tract, the pathogen is doing the same thing on a smaller scale, but without a defined gastrointestinal tract. Along with the unique susceptibility of a given host to pathogen proliferation, it is almost exclusively the degree to which a pathogen produces oxidized byproducts and other toxic substances that determines its virulence, or ability to damage and sicken the host.[8-9]

**Although the difference is somewhat subtle, this means that increased oxidative stress does not *cause* disease, but *is* the disease itself.**

**Much is written about parasites of all sizes being major factors in causing chronic disease, including cancer. When examining why a pathogen is toxic and why a parasite is toxic, it is evident that both are continuous producers of highly potent toxins where they reside and proliferate. Because of this, it can be asserted that parasites are little more than physically large pathogens.**

Many highly virulent pathogens are microorganisms that actively accumulate and thrive on the free, unbound iron available in their immediate environment.[10] Some iron-gathering pathogens secrete small molecules that actively seek out iron and bring it back to the pathogens (siderophores).[11] Other mechanisms have also been described that help the pathogen to gather iron from its environment [12-14]

As a result of this iron accumulation in pathogens, the toxic impact of pathogen death and necrosis/rupture is further magnified, as the free iron released from decomposing pathogens promptly increases oxidative stress wherever it ends up.[15-16] Increased oxidative stress from any source is going to make any medical condition or disease worse. Unless someone has an iron deficiency anemia in conjunction with depleted iron stores, any factor that further increases iron levels in the body will significantly aggravate any ongoing disease or medical condition.[17-20] The ability of the body to withhold and sequester iron is an effective defense against both infections and disease in general.[21-23] Some of the more effective antibiotics have been shown to have iron-removing (chelating) properties.[24]

**Increased oxidative stress from any source is going to make any medical condition or disease worse.**

Just as infections flourish in environments with increased iron availability, a similar phenomenon is observed with many malignant cells.[25-28] As seen with many infections, iron withholding and iron chelation are also effective adjunctive therapies in controlling cancer cell growth, including metastatic disease.[29-31]

## Pathogen Presentations

Generally, pathogen growth in a patient comes in three forms:

- ✓ Bodywide, as with a systemic infection like influenza or any other generalized infectious disease, where pathogens are present in most areas of the body
- ✓ Focal infections, as with infected teeth or other sites that have identifiable pathogen accumulations or abscesses
- ✓ Chronic pathogen colonization (CPC) is a less focal area of pathogen growth, characterized by

overall lower concentrations of pathogens. It is generally dormant, with pathogen growth occurring at a very slow rate. In this state, pathogen death is matched by new pathogen replication. CPC is characterized by overlying biofilms, which cover and coat the pathogens. These biofilms are composed of an organized matrix of extracellular polysaccharides. Biofilms block the access of prescription antibiotics to CPC pathogens, and they can persist indefinitely without being detected.[32-35]

- ✓ Overall, then, the primary sources of new toxins in nearly all patients come from the following sources, the first three of which are pathogen-generated:
- ✓ Focal infections, most commonly from the gums, teeth, tonsils, sinuses, and old tooth extraction sites (cavitations). The most common clinically significant focal infections are root canal-treated teeth and chronically abscessed but pain-free teeth (chronic apical periodontitis, or CAP), typically occurring in a mouth with some periodontal (deep gum) infection. However, focal infections can occur throughout the body, but not nearly as often as in the mouth, including the prostate, appendix, bladder, kidneys, and gallbladder.[36-40]
- ✓ Chronic pathogen colonization (CPC) is likely present in nearly all chronically diseased tissues or organs and has already been documented in many. These infections commonly reside asymptomatically on the mucosal surface of the nose, throat, and upper respiratory tract. Toxins and pathogens released from this CPC presence are continually swallowed and contribute strongly to nearly all gut problems and chronic diseases, including leaky gut and a pathogen-ridden microbiome. CPC is still not widely acknowledged as an existing condition, let alone recognized as one of enormous clinical importance.

- ✓ Pathogen-generated toxins from a chronic leaky gut and pathogen-overgrown microbiome. Toxins are generated not just by the presence of these pathogens, but also by the poor digestion they promote. Poor digestion, with food putrefaction taking its place, exposes the body to a substantial, severe, and chronic toxin exposure. With the leaky gut, pathogens can disseminate throughout the body along with any toxins they produce in the gut.
- ✓ External toxin exposures come from contaminated air, food, and water. This can be a relatively minimal factor in some patients, or it can be the most critical factor in selected individuals with a unique toxic environment. With increasing age, most people have accumulated substantial to very large amounts of heavy metals, especially in the heart, brain, and other organs and tissues with high metabolic activity.
- ✓ Toxic nutrient intake, most commonly excess calcium, iron, and copper
- ✓ Low levels of critical hormones, especially the sex hormones, thyroid hormone, and cortisol. These deficiencies promote increased oxidative stress, which further exacerbates the impact of other pathogen and toxin exposures.

**When digestion is chronically poor and the microbiome has become pathogen-ridden, along with the leaky gut that results from the pathogen-generated toxins, no condition affecting any part of the body is left unaffected. Many conditions can be primarily caused by an abnormal microbiome, which results from the dissemination of gut pathogens and the toxins they produce.**

While it is widely recognized that the gastrointestinal tract is home to a large population of microorganisms, its presence and

significance in supporting and even ***dictating*** normal metabolic functions throughout the body are not as widely appreciated. In the scientific literature, this presence is referred to as the microbiome, or the microbial ecosystem that cohabits with the alimentary tract, extending from the mouth to the anus. While it is estimated that every human has roughly 37 trillion cells, it is also estimated that everyone has about 100 trillion microbes.[41] This enormous microbiome is typically a diverse array of bacteria, fungi, protozoa, and viruses, and it is found in all animals as well as in humans. Physiological processes positively impacted by the microbiome include energy homeostasis, general metabolism, gut lining health, immune function, and even neurobehavioral development.[42] Some view the gut microbiome as a "microbial organ" because of these physiological and pathophysiological interactions with the rest of the body.[43]

**While it is estimated that every human has roughly 37 trillion cells, it is also estimated that everyone has about 100 trillion microbes.**

The medical conditions provoked or caused by an infected and toxic gut are ***virtually the same*** as those associated with pathogens originating from any other part of the body, such as those directly linked to oral infections and chronic pathogen colonizations. When pathogens and their toxins have access to the blood supply and/or the lymphatic circulation, it follows that many ***different sources of these toxins and pathogens will ultimately promote the same diseases in the body***. An extensive list of conditions associated with an abnormal microbiome confirms this conclusion. This list includes the following:

- ✓ Leaky gut (basic foundational condition for the negative impact of everything else listed below)[44-45]
- ✓ General impairment/negative modulation of immune function[46]

- ✓ Breast cancer[47]
- ✓ Pancreatic cancer[48-49]
- ✓ Colorectal cancer[50]
- ✓ Metabolic syndrome[51]
- ✓ Heart disease and heart failure[52]
- ✓ High blood pressure[53]
- ✓ Gestational diabetes[54]
- ✓ Multiple complications of pregnancy[55]
- ✓ Allergic diseases and food allergies[56-57]
- ✓ Autoimmune thyroid disease[58]
- ✓ Polycystic ovary syndrome[59]
- ✓ Migraine[60]
- ✓ Depression[61]
- ✓ Autism and autism spectrum disorder[62]
- ✓ Abnormal mental health in adolescents[63]
- ✓ Decreased cognitive function and memory[64]
- ✓ Parkinson's disease and neurodegenerative diseases in general[65]
- ✓ Stroke and other central nervous system diseases[66]
- ✓ Irritable bowel syndrome[67]
- ✓ Inflammatory bowel disease and intestinal fibrosis[68]
- ✓ Abnormal bile acid profiles[69]
- ✓ Liver disease[70-71]
- ✓ Bacterial vaginosis[72]
- ✓ Mucositis from chemotherapy and/or radiotherapy[73]
- ✓ Diabetes mellitus and abnormal lipid profiles[74-75]
- ✓ Juvenile idiopathic arthritis[76]
- ✓ General arthritic conditions[77]
- ✓ Rheumatic diseases[78]

- ✓ Gastrointestinal conditions in general[79]
- ✓ Idiopathic pulmonary fibrosis and other interstitial lung diseases[80]
- ✓ Chronic obstructive pulmonary disease (COPD)[81]
- ✓ Asthma and cystic fibrosis[82]
- ✓ Eye diseases[83-84]
- ✓ Ongoing support of periodontitis and gingivitis[85-87]
- ✓ Gastrointestinal chronic pathogen colonization (CPC) in asymptomatic kidney transplant patients[88]
- ✓ Abnormal gut microbiome secondary to antibiotic exposure
- ✓ Obesity and weight gain[89-92]

## Focal Infections and Diseases

While the impact of CPC on promoting and sustaining generalized chronic diseases should never be minimized, the contribution of concentrated focal infections is enormous as well. The most common sites of such infections (as opposed to colonizations) are in the gums, teeth, and tonsils. However, CPC can also be present in those sites as well.

When left unresolved, periodontitis (deep gum inflammation and infection) allows pathogens and their associated toxins to spread throughout the body. To assert that a disease occurring after such ***typical oral pathogens*** start growing in different tissues is some ill-defined "association" and not a straightforward cause-and-effect relationship defies simple logic and deduction. Chronic gum infection has been significantly linked to nearly all diseases and conditions. ***Some studies also document the improvement of the disease in question with effective periodontitis treatment, as well as a worsening of the disease as periodontitis progresses.***

The diseases and conditions that can be caused or promoted by periodontitis pathogens and toxins include the following:

- ✓ Cardiovascular disease and all-cause mortality, including atherosclerosis, myocardial infarction, heart failure, abnormal lipid and cholesterol metabolism (metabolic syndrome), diabetes, and arterial calcification[93-107]
- ✓ Neurological disease, including migraine, seizure, depression, bipolar disorder, dementia, Alzheimer's disease, Parkinson's disease, brain abscess, and multiple sclerosis[108-128]
- ✓ Chronic pulmonary disease, pneumonia, asthma, allergic rhinitis[129-135]
- ✓ Vascular disease[136-137]
- ✓ Obesity[138-139]
- ✓ Inflammatory bowel disease[140-142]
- ✓ Inflammatory bone diseases, including arthritis and osteoporosis[143-148]
- ✓ Kidney disease[149-151]
- ✓ Cancers (pancreatic, lung, liver, colorectal, esophageal, oral cavity and throat, head and neck, stomach, prostate, blood, skin, and cancer in general)[152-166]
- ✓ Female infertility and adverse pregnancy and neonatal/birth outcomes[167-169]
- ✓ Thyroid disease[170]
- ✓ Anemia[171-172]
- ✓ Eye disorders[173-174]
- ✓ Psoriasis[175-178]
- ✓ Ear disorders (hearing loss, vertigo)[179-181]
- ✓ Polycystic ovary syndrome[182]
- ✓ Autoimmune disease[183-185]

- ✓ Erectile dysfunction[186]
- ✓ Increased bodywide inflammation (elevated C-reactive protein levels)[187-189]
- ✓ Depressed vitamin levels (C and D) and antioxidant levels[190-196]

The data above on chronic disease and periodontal infection is also vital to understanding the impact of root canals and other infected teeth on general health. Because the pathogens found in infected teeth typically originate from deep gum infections, the infections found in the abscesses around the root tips of affected teeth have the same pathogen profile as is seen in periodontitis. However, the infected teeth, which include ***all*** root canal-treated teeth, are even more disease-causing than the infected gums, since they also have the following additional characteristics:

**Chronic gum infection has been significantly linked to nearly all diseases and conditions**

- ✓ The infected teeth have a significantly greater amount of infectious material, often manifesting as sizable root tip (apical) abscesses on X-ray.
- ✓ The infectious content in and around the root tips of the infected teeth is released directly into the draining venous circulation.
- ✓ The infectious content in and around the root tips of the infected teeth is also released into the extracellular fluid and drained directly into the lymphatic system of the teeth and jawbone.
- ✓ The act of chewing on the infected teeth greatly magnifies the expression of pathogens and toxins into the blood and lymph, as extraordinary pressures are generated between opposing teeth. Since pathogen release into the lymph occurs in

> addition to the release into the blood upon chewing, the delivery of these oral pathogens and toxins to the body is more effective and efficient with chewing on infected teeth than if the pathogens and toxins were just directly injected into a vein. The release of highly pathogenic bacteria into the blood during a root canal procedure has been documented. Notably, their release can also occur in the absence of any chewing pressure that would further promote pathogen release.[197-198]

## Chronic Apical Periodontitis (CAP)

Although less extensively studied than the relationship between periodontitis and chronic diseases, a significant amount of research has also established a link between chronically abscessed teeth (CAP—chronic apical periodontitis) and various diseases. CAP refers to a more advanced form of deep gum inflammation and infection (periodontitis), with root tip abscesses reliably visible on optimal imaging studies. Significant research studies have documented the relationship between abscessed teeth and chronic disease, which includes all root canals. CAP refers to a tooth that becomes abscessed but has not necessarily had a dental procedure performed upon it.

Root canal-treated teeth are always infected and usually have some degree of detectable abscess formation (or CAP) on the examination of the teeth and oral cavity. These studies directly mirror and further reinforce the cause-and-effect relationship of the many studies on periodontitis and chronic diseases cited above and include the following:

- ✓ Cardiovascular disease[199-204]
- ✓ Neurological disease[205-211]
- ✓ Eye infection[212]

- ✓ Inflammatory bowel disease (Crohn's disease, chronic ulcerative colitis)[213-216]
- ✓ Diabetes[217]
- ✓ Liver disease[218-219]
- ✓ Kidney disease[220-221]
- ✓ Inflammatory bone diseases[222-226]
- ✓ Autoimmune disease[227-228]
- ✓ Adverse pregnancy outcomes (prematurity, preeclampsia)[229-231]
- ✓ Increased bodywide inflammation (elevated C-reactive protein levels)[232-236]
- ✓ Reservoir for a wide variety of pathogens (bacteria, fungi, and viruses, including Epstein-Barr and herpes)[237-241]
- ✓ Increased morbidity and mortality in COVID-19 infections[242]
- ✓ Decreased physical fitness/capacity[243]
- ✓ Systemic disease in general[244]

Unfortunately, it turns out that CAP is extremely common around the world. As people age, their teeth develop small cracks and other forms of damage, and pathogens eventually reach the pulp, replicate, and drain to form abscesses at the root tips. Chronic degenerative diseases always develop for a reason, and symptom-free abscessed teeth account for many of them. Depending on the method used to calculate the figure, the prevalence of CAP in the adult population ranges from 7% to 20%. Even the 7% figure is astronomically high for an asymptomatic condition that can easily cause a heart attack or cancer. In some populations, when combined with the abscesses found on root canal-treated teeth, CAP was found in between 74% and 87% of the groups studied. Chronic degenerative disease is ***rarely*** seen in anyone with a perfectly healthy oral cavity.[245-247]

The disease-causing impact of having one or more chronically abscessed teeth is enormous. Few, if any, other conditions have as negative an impact on health as infected teeth. This makes the cone-beam computed tomography (CBCT) examination of the mouth a ***mandatory*** part of any dental evaluation when the patient has ***any*** medical condition or chronic disease, as the CBCT reveals far more pathology than any other diagnostic dental examination. It is also crucial to acknowledge that the need for this examination extends beyond adults with chronic diseases. Disease at any age occurs only when there is an ongoing source of new oxidation (new toxins) that needs to be identified and remediated. Very young children also often have advanced infections of their gums and teeth. ***A child with leukemia needs the CBCT just as much as an adult with heart disease or breast cancer.*** The most significant source of new toxins is infection, and dental infections are the most common of these, affecting individuals of all ages.

**The disease-causing impact of having one or more chronically abscessed teeth is enormous. Few, if any, other conditions have as negative an impact on health as infected teeth.**

As important as ***having*** the CBCT examination is that it gets ***correctly interpreted***. Dentists and radiologists without specific training in this examination are not equipped to interpret this test definitively. And whoever is interpreting the test needs to know the indications for ordering it, such as "rule out all root tip abscesses." Also, it is always important to ask for a close examination of all old tooth extraction sites for decreased bone density, consistent with (and sometimes clearly diagnostic for) cavitational osteonecrosis. In some patients, one or more large cavitations can destroy health ***as completely as multiple abscessed teeth.***

## Root Canal-Treated Teeth

The root canal procedure is one of the most common dental procedures. A meta-analysis revealed that more than half of the subjects in the studied populations had at least one root canal.[248] Another extensive review and meta-analysis also found that at least half of the population has at least one abscessed tooth.[249] When the always-infected root canal-treated teeth are combined with the prevalence of CAP abscessed teeth that have not received a root canal treatment, the overall prevalence of infected teeth runs between 55% and 70% of the patients studied.[250-255] Somewhere between 25 and 45 million root canal procedures are performed in the United States annually, depending on the information source. Even the low side of the estimate means that very many people are chewing on one or more grossly infected teeth every day.

Another European study found that over 60% of the individuals examined had abscessed teeth, with the prevalence steadily increasing with age.[256] Furthermore, fully 25% of teeth that had procedures ***other than*** root canal treatments ended up chronically abscessed.[257]

**Furthermore, fully 25% of teeth that have had procedures *other than* root canal treatments ended up chronically abscessed.**

A root canal treatment is typically performed when a patient presents with a painful, infected tooth. The "successful" root canal procedure results in a tooth that no longer hurts, resulting in a happy patient and satisfied dentist, at least for the moment. However, ***the infection persists as long as the tooth remains unextracted, or when the infection in the socket site after tooth extraction is not thoroughly cleaned, debrided, and sterilized (resulting in chronic cavitation formation)***.

**There is an enormous variety and total number of different pathogens and other microbes found in and around the root tips of root canal-treated teeth. Fungi, viruses, protozoa, and over 460 different types of bacteria have been identified in these infections.**[258] **No two root canals have the same assortment of indwelling pathogens, and this is why no two root canals inflict the same degree of infectious/toxic damage to the body. Nevertheless, even the "least toxic" root canals can cause severe adverse effects throughout the body.**

The physiological center of the tooth, known as the pulp, contains the nerves, blood vessels, and connective tissue matrix that keep the tooth alive and viable. Once this pulp has become infected, there is ***no*** way to eliminate the infection and restore the pulp to its normal, health-supporting state. Instead, the removal of the pulp by the root canal procedure ***permanently prevents immune system access*** to the infecting pathogens in the tooth, especially in the countless microscopic dentinal tubules extending away from the pulp throughout the tooth structure. Without immune support, no infection can be resolved.

**Once this pulp has become infected, there is no way to eliminate the infection and restore the pulp to its normal, health-supporting state.**

To stop the pain and remove much of the bulk (but never all) of the infected material, the root canal procedure drills into and routs out as much of the pulp as can be reached, after which it is filled in with an agent to maintain the overall tooth structure and keep the tooth from just being a hollowed-out, brittle body. The ends of the pulp space stretch to the tooth root tips embedded in the jawbone, and the pulp infection and its necrotic (dead) debris collect there. This results in well-defined abscesses surrounding the root tips most of the time; however,

the rare absence of easily detectable abscesses does not mean the root canal-treated teeth are free from chronic infection.

Chronically infected teeth that have not received a root canal procedure (CAP teeth) all have visible evidence of this pathology at the root tips, as this is the way they are discovered. On X-ray or computed tomography studies, variably sized abscesses will be seen, appearing as dark areas, or radiolucencies, surrounding the root tip, shaped much like the bulbous end of a green onion. Notably, unless the CBCT is part of the diagnostic evaluation, CAP teeth are ***often undetected.***

**After studying over 5,000 *consecutive* extracted root canal-treated teeth sent to him from around the country, the results were stunning. All tested teeth had significant toxins.**

When a root canal procedure is performed with optimal expertise, much of the associated root tip abscess is removed (debulked), and follow-up imaging may no longer detect it, at least immediately following the procedure. However, this does not mean the infection has been resolved; it only means that it has been effectively drained for the moment. Pathogens and their toxins still accumulate, and they are still readily expressed into the blood and lymph, especially during chewing.

Dr. Boyd Haley of the University of Kentucky conclusively proved that all root canals continuously produce toxins. He devised a test using a process called nucleotide photoaffinity labeling to measure the impact of pathogen-generated toxins on five key human enzymes in extracted root canal-treated teeth. After studying over 5,000 ***consecutive*** extracted root canal-treated teeth sent to him from around the country, the results were stunning. ***All*** tested teeth had significant toxins. Differences in the degree of toxicity among the teeth were observed, but none were found to

be free of toxins. Of note, healthy teeth extracted for orthodontic purposes ***never*** demonstrated any toxicity, even to a minor degree, ruling out "mouth contamination" as a potential reason (or rationalization) for the results.

Such variability in toxicity is to be expected, as no two root canals can have identical pathogen populations. Greater expertise in performing the procedure can help limit toxin leakage, although it can never eliminate such leakage entirely.[259]

The degree of toxicity of the endotoxins and exotoxins in root canal-treated teeth also needs to be emphasized. When tested against important enzymes in the human body, the toxins generated by root canal-treated teeth often ***vastly*** exceed the toxicity of botulinum toxin, which is regarded by many as the most toxic substance known to modern medicine. Just as *Clostridium botulinum* bacteria go from being innocuous to deadly when trapped in an anaerobic environment (like a contaminated but vacuum-packed can) that promotes the production of exotoxin, the nature of some otherwise harmless microbes in the mouth can similarly produce potent toxins when deprived of oxygen.

Dr. Haley also found similar toxin profiles in the specimens sent to him from cavitation surgery. Cavitations occur when chronic infection remains in the healed-over sockets of extracted teeth.[260] Cavitations have a comparable connection to chronic diseases, including breast cancer, although it is much less extensively studied than the connection between abscessed teeth and chronic disease.[261-264]

> **In addition to the clear visual appearance of chronic infection at the time of extraction, all root canal-treated teeth extraction sites harbor pathogens that can be cultured. Microscopic examinations of biopsy specimens from the extraction sites always reveal inflamed and necrotic bone and tissue cells resulting from the chronic infection.**

Despite the overwhelming amount of evidence in both current and historical scientific literature dating back over a century proving the ubiquitous presence of infection in root canal-treated teeth, traditional dentists and endodontists (root canal specialists) ***blindly refuse to acknowledge*** that all root canal-treated teeth are infected and will remain so. Instead, they collectively maintain that a successful root canal procedure leaves the tooth "infection-free" just because a root tip abscess was effectively drained, and the evacuation of the infected pulp relieved the pain. Some dentists performing root canals even assert that the procedure is designed to ***prevent*** infection, which is ludicrous on its face and simply impossible for the reasons already discussed. Once the pulp has been removed, even if the tooth was not already infected, subsequent infection is a physiological certainty that promptly occurs.

**...traditional dentists and endodontists (root canal specialists) *blindly refuse to acknowledge* that all root canal-treated teeth are infected and will remain so.**

Typically, the root canal procedure is performed to relieve significant tooth pain. Most of the time, such pain is due to the dental pulp already being infected with associated root tip abscess formation. The clinical success of the procedure is based entirely on whether the pain is relieved and if any abscesses that formed are significantly drained and reduced in size on X-ray. Relief of the pain usually occurs because the nerves that conduct the pain are also removed along with blood vessels and connective tissue inside the tooth pulp.

The judicious use of ozone and other disinfectant agents can effectively minimize the amount of infection in and around a given root canal-treated tooth. Still, the loss of the vital pulp and immune system access in that tooth from the procedure will always ensure

that the infection will never be completely resolved. It is also worth mentioning that the frequency of root canal procedures generates a significant portion of the income for many dental practitioners.

Lasers are now often used to treat infected teeth, especially root canals; however, complete sterilization of infected teeth ***cannot*** be achieved with this tool. While a laser of sufficient strength and focus can certainly kill anything in the beam path, it must be ***directly in the path***. Lasers cannot impact anything outside of this path, especially in the dentinal tubules that are at 90-degree angles to a laser beam in the middle of a tooth.

Contributing to the confusion about the effectiveness of a dental laser in sterilizing a tooth pulp is that such a light source will always have some scatter as it interacts with a solid object. Even though a tooth noticeably "glows" slightly as the laser beam is directed in the tooth, the entire tooth is not being sterilized. It is only being illuminated by scattered laser light. All the dentinal tubules and some of the more angular branches in the pulps remain ***entirely*** unaffected. Additionally, even if tooth sterilization were possible, it would be a temporary measure, as the root canal-treated tooth has permanently lost its immune protection against new infections.

## Cavitational Osteonecrosis

Cavitations are persistent holes or defects found at the extraction sites of permanent teeth after ***apparent*** healing has occurred. In the vast majority of cases, a thin layer of bone forms over the cavitational defect, making it appear that complete healing has taken place. This occurs because a routine extraction does not attempt to remove the periodontal ligament, which is the fibrous pocket in which the tooth is seated in the jawbone. When any of it remains, which is nearly always the case when it is not deliberately removed, the area of the bone where it remains does not "realize"

the tooth on the other side of the ligament is gone, and bone ingrowth does not take place. Complicating the diagnosis of a cavitation is the fact that virtually no traditional dentists "believe" these bony pockets exist, and even a sizeable number of biological dentists who know they ***do*** exist still do not realize how very common they are. When you don't look for something, you don't generally find it.

**Still, the loss of the vital pulp and immune system access in that tooth from the procedure will always ensure that the infection will never be completely resolved.**

In a review of 112 charts of randomly selected patients treated from 1991 through 1995 at the Huggins Diagnostic Center in Colorado Springs, CO, the widespread prevalence of cavitations at old tooth extraction sites was documented. Upon probing 691 old extraction sites with a drill bit, cavitations were found 536 times, or 78% of the time. As many of the cavitations were relatively small and often eccentrically shaped, and depending on how they healed, some cavitations were undoubtedly missed, making the 78% figure a ***minimal*** one. However, as larger teeth are extracted, the likelihood of chronic cavitation formation increases substantially. When wisdom teeth extraction sites were explored, cavitations were found at 313 of 354 sites, or 88% of the time.[265]

The pathophysiology of cavitational osteonecrosis is indistinguishable from wet gangrene, characterized by the ongoing presence of pathogens that do not grow as avidly as they would in soft tissue. The bony "walls" of a cavitation keep the infected contents well-confined most of the time, as long as it is relatively small and does not reach too deeply into the jawbone, where dissemination of the infection and toxins can be readily achieved. Nevertheless, minimal pathogen growth does occur, resulting in the low-grade and chronic production of toxic waste metabolites. The differences in cavitation

size are the main determinants of their impact on general health. When they are massive and spread to the root sites of adjacent teeth, they can be liable for causing and/or aggravating any medical condition. But when they are small and focal, their clinical impact can be inconsequential.

Some of the larger cavitations end up causing chronic facial pain syndromes or neuralgias. These cavitations are referred to in the literature as NICO, or neuralgia-inducing cavitational osteonecrosis.[266] Surgical debridement can often completely resolve this pain syndrome, although relief can be minimal to absent, and pain can eventually recur in some patients who initially responded well.[267]

Like root canals and other infected teeth, the pathogen array in the cavitation can vary widely. The nature of the cavitational contents underscores this variability and also helps to account for the differing impacts on patients' health. Cavitational contents have been described as green, yellow-green, dark, and even tar-like in appearance. Other interesting descriptions have also been reported in the literature, including blood-soaked sawdust, chocolate ice cream, spongy bone, gritty powdered dust, and green fatty globules. Consistencies can be clear and runny or have color with a clumpy nature. Not surprisingly, foul and putrid odors are often encountered as the cavitations are opened and cleaned.

**When wisdom teeth extraction sites were explored, cavitations were found at 313 of 354 sites, or 88% of the time.**

Mortality studies make it clear that cavitations can impact general health significantly, as larger numbers of cavitations are consistently associated with an increased all-cause mortality. In persons under 65 years of age, the risk of death in adults over 16 years with the loss of all teeth (edentulism) was 19% versus 10% in adults without this extensive tooth loss.[268] All-cause mortality

is also significantly associated with just the number of teeth remaining. In a study of 600 patients, a 4% increase in the 5-year survival rate was observed for each additional tooth retained at the age of 70.[269] Similarly, other studies have shown that the greater the number of teeth lost, the higher the risk of all-cause mortality.[270-272] It has also been demonstrated that, in addition to increased all-cause mortality, tooth loss was especially associated with increased cardiovascular disease, including coronary heart disease and heart failure, as well as peripheral vascular disease and ischemic stroke.[273]

**Mortality studies make it clear that cavitations can impact general health significantly, as larger numbers of cavitations are consistently associated with an increased all-cause mortality.**

A practical consideration to take away from the mortality studies noted above is that removing infected teeth is ***not*** a reliable way to eliminate the infection and associated toxicity unless proper cleaning of the tooth socket is performed immediately following the extraction. Certainly, the removal of grossly infected and abscessed teeth can always be expected to help general health in the short term. However, it is worth noting that when medical problems arise or recur, cavitational osteonecrosis at old tooth extraction sites is often the underlying cause.

The primary reason for missing cavitations as the cause or aggravator of a significant medical condition is an ongoing low index of suspicion, compounded by the fact that cavitations are often completely missed on diagnostic studies, ***including*** cone-beam computed tomography. Because of this, cavitations have long been termed as an "invisible osteomyelitis." Significant residual disease symptomatology following remediation of the rest of the infections in the mouth (gums, teeth, tonsils) should mandate

exploration with a drill bit at sites of old extractions before reasonably concluding that all oral cavity infections are no longer major players aggravating a chronic disease.

The possibility of significant cavitational osteonecrosis in a patient should always be considered when all other clear sources of systemic inflammation in the body have been ruled out or eliminated. Many studies have shown that significant cavitational disease can lead to substantial elevations in inflammatory cytokines in conditions such as breast cancer, multiple sclerosis, COVID-19 infections, cancer, and chronic fatigue.[274-277] Furthermore, the proper surgical cleaning of cavitations has been shown to reduce the levels of these inflammatory cytokines.[278]

**Many studies have shown that significant cavitational disease can lead to substantial elevations in inflammatory cytokines in conditions such as breast cancer, multiple sclerosis, COVID-19 infections, cancer, and chronic fatigue.**

A compelling account of the overwhelming negative impact of cavitational osteonecrosis is related in a very articulate manner in the book, *Sonia's Root Cause*. The author, Sonia Rial Lois, describes an incredible struggle with her health as it steadily declined over about three years. Advanced fatigue, diagnosed as fibromyalgia, and loss of mental acuity, along with an autoimmune kidney disease (glomerulonephritis) that emerged for no apparent reason, all steadily worsened and never positively responded to any treatment or intervention. She learned about the impact of dental infections and toxins and ultimately underwent a CBCT examination. Her left jawbone in the back (site of an old wisdom tooth extraction) revealed a significant loss of bone density that measured about 11 mm by 8 mm

(an extremely large defect for a cavitation). All her teeth were free of infection, and she had never had a root canal procedure. Upon a surgical cleaning of this area of the jawbone, her recovery was prompt, dramatic, and ultimately complete.[279]

> **Unless an optimal clinical and laboratory response has been observed following the resolution of gum, tooth, and tonsillar infections, all old extraction sites should be probed with a drill bit to identify any chronic cavitations, and these cavitations should be appropriately debrided when found. And when seen or suspected on X-ray or CBCT examinations, they should always be debrided sooner rather than later.**

A suggested surgical protocol for cavitation cleaning and debridement is available in Appendix C and elsewhere.[280]

## Chronically Infected Tonsils

Chronically infected tonsils have characteristics of both a focal infection and a chronic pathogen colonization. Small abscesses are often present along with evidence of biofilms overlying the pathogens in other areas of the tonsillar tissue as well. The biofilms found in infected tonsils contribute significantly to the increasing resistance observed when treating them with antibiotics.[281-283]

Collectively, the tonsils are large masses of lymphoid tissue that some authors consider to be variations of lymph nodes in terms of their physiological roles in the body. The "traditional" tonsils are known as the palatine tonsils, as they are adherent to the soft palate near the oropharynx and nasopharynx at either side of the back of the tongue in front of the throat. These tissue masses are the primary sites that become enlarged and/or chronically infected, mostly in children with severe and frequently recurrent tonsillitis, and that ultimately require removal during tonsillectomy.

Sometimes, the removal of the palatine tonsils is necessary to ease partially obstructed breathing as well. A smaller associated site of lymphoid tissue is on the back of the nasopharynx in the midline behind the nose (pharyngeal tonsil or adenoid). This tonsillar tissue is also commonly removed along with the palatine tonsils during the same surgery ("tonsillectomy and adenoidectomy").

Another site of lymphoid tissue is the lingual tonsil, located at the base of the tongue, directly facing the back of the throat. A tonsillectomy can also involve the removal of the lingual tonsil, especially when it is partially obstructing free air flow. Two less-defined areas of tonsillar-like tissue are located on both sides of the mouth between the palatine tonsils and the centrally located pharyngeal tonsil, embedded beneath the mucosa cells of the eustachian tubes, known as the tubal tonsils. Nevertheless, these tubal tonsillar "areas" will often become inflamed and hypertrophied secondary to their proximity to inflamed and hypertrophied adenoid tonsillar tissue.

The symptomatic manifestations of this tubular tonsillar tissue hypertrophy can include obstructive air passage and sleep disorders, rhinosinusitis (characterized by a runny nose and inflamed sinuses), and recurrent ear infections (otitis media). This hypertrophy is not uncommon, and it was found to be present in 10 of 24 patients evaluated for recurrent or persistent symptomatology after adenoidectomy.[284] In addition to all these more defined masses of tonsillar tissue, there are also less concentrated areas of associated lymphoid tissue on the back of the throat (lateral pharyngeal bands and areas on the posterior pharyngeal wall).

When viewed from an anatomical perspective, the distribution of all these tonsillar structures effectively forms a circle of lymphatic tissue around the back of the mouth as it merges with the throat and extends up into the nasopharynx. This collection of tonsillar tissue is known as Waldeyer's ring. This ring configuration of the tonsillar tissue facilitates its role in preventing or minimizing the entry of

pathogens, especially bacteria and viruses, into the body. There is also an encircling array of lymph nodes considered to be the outer ring of Waldeyer's. Nevertheless, this collection of lymphatic tissue in Waldeyer's ring is regarded as a supportive, yet relatively minor, factor in the immune prevention of infection.

**The biofilms found in infected tonsils contribute significantly to the increasing resistance observed when treating them with antibiotics.**

Even today, many authors assert that the physiology of the tonsils, especially with relation to the immune system, remains poorly understood. A meta-analysis of 35 articles concluded that the loss of tonsils through tonsillectomy has no clinically significant adverse effects on the immune system. However, the reviewed studies examined different combinations of immune parameters, and four of the articles concluded that tonsillectomy did have some negative impact on the immune system.[285]

In the 1950s, Dr. Josef Issels made some remarkable discoveries that remain largely unknown to the medical and dental community.[286] His clinic in Germany treated primarily advanced cancer patients who were seeking to avoid chemotherapy in their pursuit of health. In surveying his clinic data, he found that 98% of these cancer patients had between what he termed "two and ten dead teeth." His treatment not only involved the proper removal of such infected and necrotic teeth but also routine tonsillectomy. However, the tonsillectomy was not part of the protocol until he had observed that a significant number of his patients (10% to 20%), who initially did well after the extractions, later experienced myocardial infarctions. After making tonsillectomies a part of his treatment protocol in these advanced cancer patients, the prevalence of heart attacks dropped precipitously.

**Dr. Issels asserted that "chronically inflamed tonsils are primary head foci which sometimes have an even more damaging effect on the organism as a whole than dental foci," noting that the tonsils are "excretion organs by which the lymphocytes, microbes, toxin-laden lymph, and other matter are discharged."**

Most significantly, Issels found that in every tonsillectomy performed on his cancer patients, biopsy revealed that "severe or very severe destructive tonsillar processes" were present along with chronic infection. This was despite the fact that the tonsils did not appear enlarged, inflamed, or infected on examination, which is the primary reason they often go unnoticed or untreated. While chronically draining the lymph of infected teeth and gums results in the tonsils becoming chronically infected, it does not result in them becoming swollen, as is routinely seen with lymph nodes that are part of an infection-draining pathway.[287] This needs to be differentiated from acute or recurrent tonsillitis, with clear inflammation and often massive tonsillar swelling, as is frequently seen in children.

The lymphatic flow into the tonsils is directly connected to the lymphatic drainage of the jawbone that anchors the infected teeth and gums discussed above. Issels noted that Indian ink injected into a sealed dental cavity resulted in the appearance of inky spots on the tonsillar surface in only 20 to 30 minutes, establishing the direct nature of this connection.

The tonsils are designed to support the immune system in dealing with short-term pathogen challenges presented to the oral cavity. However, when the tonsil continuously drains a chronic jawbone infection, in the form of infected gums, abscessed teeth, or cavitations, it becomes overwhelmed to the point that it shifts from protecting against infection to ***becoming a central focal point of chronic infection itself.***

**In any patient with infected teeth who has had them extracted, it must be assumed that the tonsils have also become sites of focal infection. This is especially the case when C-reactive protein (CRP) levels are elevated and remain so after the infected teeth have been properly removed and the infected gums have resolved. A complete remediation of oral cavity infections remains in question as long as the CRP remains elevated.**

Currently, several methods are available to improve and even resolve chronic tonsillar infections, and these should be used in combination whenever possible. Aside from tonsillectomy as a more definitive solution, the tonsils can be treated with:

- ✓ Direct ozone gas injections;[288] one protocol uses a 30-gauge needle 1.5 inches long, with up to 2.5 cc per injection, of ozone gas with a concentration of 10 to 50 gamma
- ✓ Periodic ozone gas ear insufflation treatments. This works to deliver ozone into the middle ear as well as systemically. Low-grade middle ear chronic pathogen colonizations are the cause of many ear conditions. With the direct connection of the middle ear to the nose and throat via the Eustachian tubes, these colonizations can reseed these areas after they have been effectively eradicated, as with hydrogen peroxide nebulization.
- ✓ The application of a few drops of 1% pharmaceutical-grade methylene blue (MB) directly to each tonsillar surface daily for several weeks. A highly anti-pathogenic and nontoxic antioxidant, MB is fat- and water-soluble, and it easily penetrates the tonsils and their cells without the need for direct injection.

When normal-appearing tonsils are treated with the above measures and a previously elevated CRP level returns to normal,

it can be reasonably assumed that the risk of heart attack has been substantially decreased due to substantial or complete resolution of the tonsillar infection.

This tonsil treatment protocol also works well for the large and inflamed tonsils of childhood tonsillitis. When the tonsillar size and inflammation have resolved, along with a normalization of the CRP level, the tonsil has likely returned to a normal or near-normal state. ***But regardless of the CRP response, many childhood tonsillectomies could be avoided entirely with these treatments, as many are performed because the tonsils have enlarged to the point of obstructing easy breathing, and these tonsil treatment measures will readily decrease tonsillar swelling.***

Knowing the most important and common of toxin exposures then dictates that the basic treatment principles for all chronic disease should be to:

- ✓ Prevent or minimize new daily toxin exposure (environmental, dental, dietary, digestive)
- ✓ Neutralize existing toxins already present in the body
- ✓ Excrete toxins (by chelation or other detoxification measures) in as nontoxic or minimally toxic a manner as possible, as detoxification always causes some re-toxification
- ✓ Identify and resolve, or minimize, all focal infections and areas of CPC. This also involves eliminating the factors that favor contracting new infections.
- ✓ Supplement optimally to maximize the antioxidant/nutrient status of the body as completely as possible.
- ✓ Eat an optimally nutritious diet with close attention to proper food combining to optimize digestion and minimize food putrefaction.

- ✓ Diagnose and address critical hormone deficiencies, most commonly the sex hormones, thyroid hormone, and cortisol. Treatment should aim to bring hormones into at least the mid-range of normal on laboratory testing (versus just low-normal).

## Recap

The concentration and distribution of excess oxidized biomolecules inside the cell is the disease itself. Furthermore, the reason toxins are harmful is that they all induce oxidation wherever they encounter biomolecules. An oxidizing agent is a toxin, and a toxin is an oxidizing agent. They are synonyms and mean the same thing. The straightforward conclusion is that toxins cause all disease. It then follows that:

> **Any circumstance or condition that introduces more toxins into the body or generates additional toxins within the body is the direct cause of all known medical conditions or diseases. All toxins cause disease (excess oxidation), and all diseases are solely caused by toxins.**

While a given individual may have a uniquely high exposure to a significant environmental toxin, the primary reason for most disease-causing toxin exposures is due to pathogens. These pathogens can manifest as focal abscesses or less concentrated areas of chronic pathogen colonization. There are multiple and highly effective ways to lessen and even eliminate these pathogen-generated sources of toxicity.

Choosing a highly trained biological dentist is essential to minimize the possible outcome of significant disease and suffering. Anyone who selects a traditional dentist is taking grave risks with their long-term health. Additionally, regardless of the chosen dentist, a ***thorough and informed consent*** that relates to the estab-

lished data in this chapter must be provided to the patient, without minimizing the risks associated with the root canal procedure. When a patient gets a root canal and ends up with a heart attack or cancer, and was ***never told*** of this possible outcome, dental malpractice has occurred.

## Chapter 3

*There is nothing so confining as the prisons of our perceptions.*
William Shakespeare

# Disease-Causing Nutrients

## Too Much of a Good Thing

Most clinicians know that when a little is good, more is often better, but a lot is reliably toxic. This results in the mindset that there is little chance of causing harm when supplementing with a "little," especially when the nutritional supplements involved are well-known, relatively popular, and widely regarded as unquestionably beneficial.

Referring to a nutrient substance as toxic may seem contradictory and even ridiculous. However, some nutrients are essential for good health, but can be easily ingested to a toxic level. In the case of calcium, iron, and copper, the downside of even minimal supplementation could not be more clear-cut. All three are essential for health, particularly within cells. Nevertheless, once a relatively low daily intake of these nutrients is exceeded, even by the smallest amount, toxicity rapidly ensues, with the highest intakes resulting in the most severe toxicity.

This is in stark contrast to other nutrients, such as vitamin C, niacin, niacinamide, or vitamin K2, where toxicity is difficult to achieve at any degree of intake or supplementation. Many other nutrient supplements, especially minerals, can readily be ingested to the point of toxicity. However, the relative amounts needed to reach toxicity are still vastly greater than those required to achieve a toxic state from the intake of calcium, iron, and copper.

## The Danger of Excess Calcium Intake

### Cellular Calcium Excess Underlies All Disease

Generally, the differences between nutrients and toxins are very clear-cut, and the consumer does not need to doubt that what is being consumed in dietary or supplemental form supports good health. And with nearly all good nutrients, there is rarely a well-defined upper limit on how much can be safely consumed. Clinicians generally feel, and appropriately so, that when a little is good, more is better, yet an enormous amount can end up becoming toxic. Virtually all supplements and nutrient agents can be taken as recommended and are generally considered to be utterly devoid of any toxicity concerns. However, calcium represents a major exception to this "rule."

**...excess calcium intake is the primary fuel sustaining and even provoking heart disease, cancer, and all chronic degenerative diseases.**

While calcium is continually promoted as a nutrient essential for good health, the most crucial fact regarding calcium is almost never mentioned. A limited amount of calcium is good. But just a little more is bad. And a lot is the primary factor in precipitating and sustaining all disease.

The downside of excessive calcium intake is addressed in more detail later in this chapter, as it warrants deeper analysis, given that its intracellular excess is the primary manifestation of cellular pathology in all diseases. However, a few key points deserve further emphasis. The marketing efforts of the dairy industry over the years have been highly successful in convincing the public, as well as most doctors, that high calcium intake through diet (especially dairy) and, by extension, supplementation is beneficial to overall health and essential for healthy bones. Unfortunately, the exact opposite is true, and excess calcium intake is the primary fuel sustaining and even provoking heart disease, cancer, and all chronic degenerative diseases. To be concise:

> **Elevated intracellular calcium levels are present in all cells involved in any disease, and very high levels are present in all malignant cells.**

Furthermore, healthier cells always result when therapeutic measures are taken to reduce these intracellular calcium levels.[1]

Menopause, characterized by the loss of estrogen production in affected women, directly contributes to increased intracellular calcium levels.[2] Normal estrogen levels effectively minimize cytoplasmic calcium concentration as estrogen serves as a calcium channel blocker, limiting calcium uptake into cells. Consistent with this, it has now been demonstrated that menopause promotes increased coronary artery calcium scores.[3] Testosterone, the male sex hormone counterpart to estrogen, also serves as a calcium channel blocker throughout the body.[4] This vital relationship, in which increased intracellular calcium levels result from decreased sex hormone presence, further underscores the importance of providing some sex hormone support to all older patients, even when hormone levels fall

within the 'normal' laboratory reference range, particularly when the level rests in the lower portion of the range.

Hypertension (high blood pressure) is a common chronic disease, and prescription calcium channel blockers are highly effective drugs for treating it, as they reliably lower intracellular calcium levels, thereby reducing elevated blood pressure. Not surprisingly, given their significant impact on reducing the toxic levels of calcium found in all diseased cells, long-acting calcium channel blockers have also been shown to decrease all-cause mortality.[5-8] calcium channel blockers have also been shown to decrease ferritin levels in hypertensive patients, and calcium channels have been suggested as portals for abnormal iron uptake in the heart.[9-10] Lowering intracellular calcium and iron (ferritin) levels is a reliable way to increase longevity.

**Not surprisingly, given their significant impact on reducing the toxic levels of calcium found in all diseased cells, long-acting calcium channel blockers have also been shown to decrease all-cause mortality.**

To be clear, the very well-defined relationship between calcium content inside the cells of the body and disease-causing increased intracellular oxidative stress means only one thing:

**Never supplement calcium.**

## Calcium and Oxidative Stress

As discussed in Chapter 1, increased oxidative stress within cells, also known as increased intracellular biomolecule oxidation (IBO), is the entirety of disease. When oxidation inside the cells is minimal and "physiological" in degree, resulting only

from normal metabolism, intracellular health is optimal. When cellular calcium levels are normal, the cell's oxidation status is also normal. As those levels increase, the degree of oxidation (oxidative stress) rises in concert with them. The highest levels of intracellular calcium are observed in malignant cells and cells undergoing necrosis, a process that ultimately leads to frank cell rupture. The whole concept of cancer chemotherapy is to push oxidative stress inside cancer cells to the point of total cellular breakdown. Of course, a significant downside of chemotherapy is that it will also have a similar impact on many normal cells in the body. This can be summarized as follows:

> **Elevated intracellular calcium levels are present in all cells involved in any disease or medical condition, and very high levels are present in all malignant cells.**

While the mechanisms have not been precisely elucidated, calcium directly increases intracellular oxidative stress as it accumulates within cells. It also rises as a reflection of other agents (toxins) that cause increased oxidative stress on their own. This results in more cellular calcium being both a *cause* of increased oxidative stress and the *result* of increased oxidative stress. Either way, increased oxidative stress in the cells of a diseased tissue or organ requires the lowering of elevated intracellular calcium levels as a primary goal of any therapy. *If cellular calcium levels cannot be reduced, significant clinical benefits will never be realized, and the cells will remain abnormal.*

Calcium is concentrated up to 10,000 times more outside the cells than inside them, and considerable energy needs to be expended to keep the much lower cellular levels from increasing to toxic, pro-oxidative levels. The primary ways in which calcium levels are regulated inside the cells include the following:

- ✓ Changes in cell membrane permeability[11]
- ✓ The concentration of intracellular calcium-binding proteins. Free calcium, not bound calcium, is the calcium form that most directly impacts intracellular oxidative stress.[12]
- ✓ Removal from the cytoplasm to storage in the nucleoplasm (space around the nucleus)[13-14]
- ✓ Activity level of the calcium extrusion mechanism ("calcium pump") pushing calcium back outside the cells[15]
- ✓ Modulation of calcium channel proteins across the cell membrane. Limiting the transport of calcium through calcium channels into the cells is of critical importance in controlling the intracellular calcium concentration. Nutrients and drugs with calcium channel-blocking ability are especially suitable therapies for most conditions, and their use is associated with a decreased risk of all-cause mortality.[16-20] They also work to decrease iron uptake into cells, a factor that reliably decreases any elevations in cellular oxidative stress.[21-22]

The calcium channels mentioned above are diminished in their ability to usher calcium into the cells by drugs known as calcium channel blockers and by the nutrient/mineral magnesium, which is a natural calcium channel blocker. Nearly all the positive clinical effects of magnesium and prescription calcium channel blockers can be attributed to their ability to limit calcium entry into cells. Although widely used for various conditions, calcium channel blockers are primarily employed for managing high blood pressure and other conditions characterized by increased vascular tone, as their effects work to relax the smooth muscle surrounding the arterial blood vessels. When too high a dose of these drugs is given, hypotension results.

Even though calcium is a vital nutrient essential for the health of all cells, elevations of cellular calcium nevertheless remain the final common denominator for:

- ✓ All chronic diseases,
- ✓ The development of all cancers, and any eventual metastases that might take place,
- ✓ The dissemination of previously focal and contained infections,
- ✓ And premature cell death wherever it occurs.

Multiple studies have revealed the tremendous toxicity associated with excessive calcium intake. In a landmark study of 61,433 Swedish women followed for a median of 19 years, those who consumed the most total calcium from both diet and supplementation had an all-cause mortality rate 250% greater than those with the lowest calcium intakes. Similarly, the same group with the greatest calcium intake had a more than 200% increase in mortality from coronary artery disease.[23] A meta-analysis of 15 trials also clearly established an increased risk of heart attack in patients who took calcium supplements.[24] Another meta-analysis of studies on this issue found that calcium supplementation increased the risk of myocardial infarction by 27-31% and the risk of stroke by 12-20%.[25]

**This results in more cellular calcium being both a *cause* of increased oxidative stress and the *result* of increased oxidative stress.**

Approximately one-third of Americans over 45 years of age have demonstrable arterial calcifications, as shown by computed tomography.[26-28] Calcification in the middle (media) of the arterial walls throughout the body has been implicated as contributing to generalized arterial disease, as well as the formation of atherosclerotic plaques.[29] Calcium should never

be deposited anywhere other than in the bones under normal physiological circumstances, and calcification at this young age underscores the fact that excess calcium inside older mature bodies is much more common than not. Furthermore, a significant amount of calcium excess must be present in the extracellular spaces well before frank calcium deposition occurs.

**Nearly all the positive clinical effects of magnesium and prescription calcium channel blockers can be attributed to their ability to limit calcium entry into cells.**

Consistent with the excesses of calcium commonly seen in older individuals, calcifications are frequently found in different cancers. Using advanced magnetic resonance imaging, 22 of 23 prostate cancer patients were found to have calcifications in their prostates.[30-31] Breast calcifications are usually found in breast lumps or other sites that prove to be malignant, or eventually become malignant.[32-33] And women with the highest scores on bone density testing had an increased risk of developing breast cancer.[34] Bone density scores will cosmetically improve with large amounts of calcium supplementation, but do not reflect increased bone quality.

The Coronary Artery Calcium (CAC) score has been used for over 30 years to monitor the likelihood of a patient dying of coronary artery disease (heart attack). A higher score indicates an increased chance of cardiac death. A computed tomography scan generates a diagnostic score for the calcium content in the targeted area. Greater calcium deposition in the coronary arteries produces higher CAC scores.[35] Furthermore, therapeutic measures that can decrease calcium accumulation are directly correlated with a decreased risk of cardiac death. Some investigators have called

the CAC test a "mammogram for the heart," since most positive mammograms reflect a focal calcium deposition at a site that has or will develop into a cancer.[36]

Logically, the CAC score indicates the presence and deposition of excess calcium throughout the body, not just in the heart. This has been proven to be the case, as the CAC score also predicts all-cause mortality and not just death from coronary artery disease.[37-39] Additionally, a relatively small increase (20 units) in the annual CAC score was sufficient to reliably predict an increasing likelihood of all-cause mortality in the study group.[40]

While it should be clear that the most desirable CAC score is zero, such a score does not confirm a complete lack of excessive calcium around the cells. Positive calcium scores establish that a state of excessive calcium has been present and sufficiently pronounced for a long enough period to form detectable calcium deposits. A score of zero is excellent, but it does not mean that patients with a zero score can safely consume as much calcium as they wish.

**Using advanced magnetic resonance imaging, 22 of 23 prostate cancer patients were found to have calcifications in their prostates.**

It is also important to realize that women with low bone mineral density most commonly die of a chronic degenerative disease, such as heart disease or cancer, This further supports the idea that calcium supplementation, which has been shown to increase death from all causes already, should not just be "triggered" by the finding of significantly low bone mineral density testing. It makes no sense to trade a lesser incidence of osteoporotic fractures for a variety of life-threatening chronic diseases, especially cancer and coronary heart disease.[41]

Notably, the loss of estrogen production in women after menopause onset ***directly*** adds to increased intracellular calcium levels, which is expected to contribute to the development and progression of various diseases.[42] The primary sex hormones (estrogen and testosterone) serve as natural calcium channel blockers, which limit calcium accumulation inside the cells.[43-44] Furthermore, estrogen deficiency (menopause) has been shown to promote increased CAC scores.[45] Similarly, testosterone deficiency directly correlated with increased CAC scores.[46]

Studies that have especially indicated the pro-oxidant (toxic) impact of excess calcium include the following:

- ✓ Only when intracellular calcium levels are at their highest can cell death (apoptosis) or maximal cancer cell proliferation and metastasis occur.[47-48]
- ✓ Toxins increase intracellular calcium levels, resulting in increased oxidative stress and, ultimately, cell death.[49-51]
- ✓ Elevated intracellular calcium levels have been consistently seen in the diseases where they have been examined. They are elevated in amyotrophic lateral sclerosis (ALS), Parkinson's disease, and Alzheimer's disease.[52-54]

## Five Common Calcium Myths

### MYTH #1:

**Calcium supplementation prevents fractures.**

While this assertion is unquestionably accepted as true by most doctors and osteoporotic patients, nothing could be further from the truth. More specifically,

- ✓ Studies showing decreased fracture incidence with calcium supplementation consistently ***included vitamin D*** supplementation as well.[55-57]

- ✓ Adequate vitamin D supplementation ***alone*** improves bone quality and decreases fracture incidence.[58-62]
- ✓ Calcium supplementation alone does ***not*** prevent fractures.[63]
- ✓ Many healthcare practitioners are misled by slightly improved bone mineral density test results after administering high doses of supplemental calcium. More calcium does end up in the bone, but without the other supporting bone-building substances. This leaves the bone quality in a poor and physically unstable state.[64-65] It is analogous to a fresh coat of paint on a brittle wooden fence. It looks a little better, but still breaks as readily as when you lean on it without the paint.

**MYTH #2:**

**Calcium supplementation and increased dietary calcium are good for you.**

On the contrary, women with the highest calcium intake from diet and supplements had an all-cause mortality risk of 250% higher than those women with the lowest total calcium intake.[66]

**MYTH #3:**

**Everyone with osteoporosis has a calcium deficiency.**

The correct statement is that patients with osteoporosis do have a calcium deficiency ***in their bones.*** However, this loss of calcium in the bones means there is an ongoing supply of calcium to all the other areas of the body. And when the calcium released from the bones into the rest of the body is accompanied by calcium supplementation as well as high dietary calcium, the non-skeletal tissues in the body will always have too much calcium.

**MYTH #4:**

**All diets are deficient in calcium if significant dairy is not consumed.**

There is absolutely no scientific evidence to support this claim. Not surprisingly, this false assumption is entirely due to the persistent marketing efforts of the dairy industry. "Milk is a natural." "Milk does a body good." "You never outgrow your need for milk." "Got milk?" When assertions like this are supported by so many uninformed doctors still advocating calcium supplements for many of their patients, calcium excess will continue to be the rule, especially with most older patients.

**MYTH #5:**

**The most significant danger faced by the osteoporosis patient is disability or death following a fracture.**

Although very commonly assumed to be the truth, fractures do not kill or disable osteoporosis patients nearly as often as diseases such as cancer and heart disease.[67-68] In 10,000 postmenopausal patients with osteoporosis or osteopenia (low bone mineral density), a 60% increased chance of death was seen in the heaviest calcium supplementers.[69] However, most of the deaths did NOT relate in any way to a fracture. In other words, the consequences of excess calcium intake result in much more morbidity and mortality than the consequences of an osteoporotic fracture.

## Copper and Iron: The Toxic Twins

Why call these two transition metals twins? It is because these metals are both prominent promoters of the Fenton reaction inside the cells of the body. All cells contain them, but oxidative stress rapidly intensifies when these metals increase in concentration, even by the ***tiniest degree***. And as increased oxidative stress (where excess biomolecules are in the oxidized, electron-depleted state)

is maintained or even further elevated, abnormal cell function ("disease") flourishes.

The oxidation stimulated by ionic iron (Fe3+, Fe2+) and ionic copper (Cu2+, Cu1+) remains minimal ("physiological") as long as there is no significant increase in the intracellular levels of these metals, especially when supplemented. Most reasonably balanced diets will never supply too much of these metals, although even the most minimal supplemental intake can easily disrupt this delicate balance.

The Fenton reaction plays a crucial role in the body's ability to eliminate pathogens, pathogen-infected cells, cancer cells, and cells with massively increased intracellular oxidative stress that are on the border of necrosis and/or other forms of cell death, such as apoptosis. When not kept at a minimal activity level, the Fenton reaction also plays a significant role in the chronic toxicity inflicted by increased iron and copper intake. Both elements are called transition metals because they readily shuttle electrons through various metabolic pathways. This ease of electron passage is why iron and copper conduct electricity so well (current equals electron flow).

**Notably, the loss of estrogen production in women after menopause onset *directly* adds to increased intracellular calcium levels, which is expected to contribute to the development and progression of various diseases.**

The classic Fenton chemistry is observed in a pathogen-infected cell, particularly when stimulated by a sufficient dose of vitamin C. While vitamin C has numerous immune-supporting and anti-pathogen properties, the promotion of Fenton chemistry within the cell accounts for much of its infection-resolving properties.

The most virulent pathogens are the most avid consumers of iron. This characteristic allows most pathogens to target themselves for destruction when enough electrons (such as those supplied by high-dose vitamin C) can fuel the iron-triggered Fenton chemistry metabolism. At the same time, the high iron content also fuels the growth and aggressiveness of the pathogens.[70-72] Notably, some antibiotics derive much of their effectiveness from their ability to chelate iron, thereby weakening the pathogen as it loses access to new sources of iron for its growth.[73]

**This characteristic allows most pathogens to target themselves for destruction when enough electrons (such as those supplied by high-dose vitamin C) can fuel the iron-triggered Fenton chemistry metabolism.**

The following activities describe how to provoke a typical Fenton reaction-fueled destruction of a pathogen and its host cell:

- ✓ Fifty or more grams of vitamin C are infused into the patient.
- ✓ As the vitamin C floods the extracellular space, active and passive vitamin C transporters increase vitamin C levels inside the cells.
- ✓ At the same time, in the extracellular space, the vitamin C continually stimulates the formation of large quantities of hydrogen peroxide.
- ✓ The extracellular hydrogen peroxide, which is already elevated within the infected cell, along with its attendant focal hypoxia and acidosis, readily passes from the extracellular to the intracellular spaces.
- ✓ The vitamin C donates an electron to Fe3+ (or Cu2+), with a reduction to Fe2+ or Cu1+.

- ✓ The reduced metal ion then passes the electron to the available hydrogen peroxide, resulting in its prompt breakdown into a highly pro-oxidant (toxic) entity known as the hydroxyl radical ($OH^{\cdot}$).
- ✓ This radical is so reactive that it cannot migrate; instead, it immediately oxidizes whatever it is adjacent to upon formation.
- ✓ Sustained formation of new hydroxyl radicals rapidly increases oxidative stress to the point of pathogen or cell rupture or apoptosis.
- ✓ Increased hydrogen peroxide inside the cell also mobilizes Fe3+ release from ferritin storage sites, ensuring adequate reactive iron to continue fueling the Fenton reaction to completion.
- ✓ Therefore, continued VC infusion ensures that all components of the Fenton reaction are sufficiently present to continue until pathogen or cell death has been achieved.

This interaction of vitamin C with copper (or iron), with the subsequent upregulation of the highly pro-oxidant Fenton reaction, was nicely demonstrated in a study on mice. It has been demonstrated that the simultaneous administration of vitamin C ***and*** copper leads to increased systemic oxidative stress and kidney cell injury.[74] However, without the presence of copper to facilitate the formation of the hydroxyl radical, ***protection*** against increased oxidative stress in the kidneys was readily achieved by vitamin C alone.[75]

It is well-established that both iron and copper play important roles as cofactors in various metabolic pathways and enzyme reactions.[76] However, the total pool of reactive iron and copper in the body that plays these roles is ***extremely small***, and it is almost entirely maintained by an ***ongoing recycling*** of these metals inside the cells. Very little of these metals gets excreted, so minimal new

intake is needed to maintain the required levels to fully support these various metabolic functions.

The most critical nutrient supplements need regular dosing to counteract daily excretion in the stool and urine. This is NOT the case with iron and copper. They are not "consumed" in acting as cofactors in their multiple metabolic reactions. Nevertheless, these two metals exhibit a powerful, adverse synergistic effect in causing oxidative pathology. A good example of this is the elevated levels of copper and iron found in human atherosclerotic plaques.[77]

Relatively large amounts of iron, and to a much lesser extent, copper, are needed to maintain the normal synthesis of new red blood cells, compared to the tiny amounts required for their cofactor metabolic functions. A copper deficiency anemia is very rare, but iron deficiency anemia is much more common.[78-79] An iron deficiency anemia rarely occurs without significant blood loss, as seen with heavy menstrual bleeding or a bleeding gastrointestinal tumor. The patient should always be evaluated for a source of blood loss when an iron deficiency is present.

> **The bottom line for patient management is that when there are normal hemoglobin and hematocrit levels, iron supplementation should *never* be given.**

Levels of ferritin, the storage form of iron, can never be considered too low and should never be a criterion for iron supplementation if the hemoglobin level is normal. If enough iron is present to maintain normal hemoglobin synthesis, there is much more than enough iron in the body to support its cofactor functions. Any supplementation beyond the support of normal blood synthesis needlessly and ***reliably*** fuels excess oxidative stress throughout the body.

Too much supplementation "guidance" comes from researchers who have found that agent X has some undesirable effect on enzyme or chemical reaction Y in a test tube (*in vitro*) or animal cell (*ex*

*vivo*) study, without any regard for how important this might be in the intact patient. Taking a "deep dive" on trying to understand as much as possible about a supplement is fine, but the "macro" study should always be given much greater practical regard than the "micro" study, especially when such "micro" studies are taking place in animal cells or test tubes. Extrapolations from such "micro" studies as to what supplement is good for the entire human body are often not as straightforward as one would like.

**Levels of ferritin, the storage form of iron, can never be considered too low and should never be a criterion for iron supplementation if the hemoglobin level is normal.**

A good example comes from studies examining the interactions between vitamin C and copper. In rats, it has been shown that increased dietary vitamin C levels increase blood vitamin C levels while reducing copper's plasma and tissue concentrations.[80] In another study, men and guinea pigs were supplemented with vitamin C. The supplementation increased the men's ceruloplasmin (copper-carrying protein) levels while decreasing them in the guinea pigs. The authors concluded that vitamin C antagonizes copper metabolism in guinea pigs but not in humans.[81] A cell study concluded that vitamin C exerts both positive and negative regulatory functions in copper metabolism; however, the underlying mechanisms were unclear.[82]

When considering the advisability of copper supplementation based on the studies above, it is worth noting that vitamin C, at least in rats, can reduce plasma and tissue copper concentrations, which is a ***good*** outcome. Based on the ease with which added copper can worsen oxidative stress, the ability of vitamin C to minimize its presence in the body can easily be considered a desirable effect, without just assuming that a chronic lowering of copper presence in the body will somehow cause a harmful copper deficiency.

Linus Pauling started taking 3 grams of vitamin C daily as soon as he learned of it in the 1960s, gradually increasing the amount until he was taking 18 grams a day in the last years of his life. Dr. Pauling died at the age of 93 and remained well enough to give lectures and speeches up to the last few months of his life. If Dr. Pauling suffered from a vitamin C-induced deficiency of copper in his body, there was no clinical evidence that harm was being done. Quite the contrary, the loss of the ability of the human liver to make megagram doses of vitamin C daily and release it directly into the bloodstream argues that any copper-lowering effects of vitamin C are beneficial, and that most of the human population is dealing with some degree of copper toxicity already that is no longer being alleviated by the missing endogenous production of vitamin C in the genetically-defective human liver.[83]

The consistent relationship between elevated copper levels and carcinogenesis should cause grave concern for health seekers who regularly supplement with copper. Many studies have consistently shown that those individuals with the highest blood levels of copper contract and sustain the most cancers. Just as cancer cells thrive on increased amounts of iron, they are also stimulated by increased exposure to copper.

**Tumor copper levels and blood copper levels are elevated in a wide variety of cancers, including those of the breast, cervix, ovary, lung, stomach, bladder, thyroid, oral cavity, pancreas, and head and neck.**

Consistent with its ability to increase oxidative stress within cells, evidence suggests that the continued presence of excess copper is a significant factor in both initiating the malignant transformation of cancer and fueling its aggressive growth and spread. Tumor copper levels and blood copper levels are elevated in a wide variety of cancers, including

those of the breast, cervix, ovary, lung, stomach, bladder, thyroid, oral cavity, pancreas, and head and neck.[84-97] Additionally, ceruloplasmin, the copper-storing protein, is also more prevalent in several types of cancer, including those of the lung, kidney, bladder, bile duct, and breast.[98-103] Other medical conditions associated with increased ceruloplasmin and copper include aortic dissection, increased intracranial pressure after brain injury, acute and chronic kidney disease, multiple sclerosis, heart failure, Alzheimer's disease, pre-eclampsia, myocardial infarction, and vascular aging.[104-114]

Furthermore, higher serum levels of copper are seen in more advanced stages of cancer and are directly correlated to how readily the malignancy grows.[115] In some hematological malignancies, periods of cancer remission are observed as serum copper levels decrease.[116] And just as less copper can induce cancer remission, more copper can be given as oxidation-inducing "chemotherapy" to push the already increased intracellular oxidative stress (Fenton reaction) even higher, with cancer cell death eventually resulting.[117-118]

Always look for the longevity (all-cause mortality) studies to get the clearest picture of the ultimate impact of an agent on the human body. The effect that something has on isolated metabolic functions in the cytoplasm is often completely irrelevant (the "accumulation of minutia," as Dr. Robert Cathcart once noted) if it argues against taking a supplement that was already proven to decrease all-cause mortality. This is even more the case when it involves an animal or an *in vitro* study. As Dr. Abram Hoffer once noted, studies can make good scientific points while remaining "clinically unimportant."

Furthermore, such "micro" data should never be used, intentionally or unintentionally, to instill fear in the hearts of potential users of a beneficial agent, such as vitamin C. It has long been established in "macro" studies that individuals who maintain the highest blood levels of vitamin C live the longest.[119-120] In the face of such data, if vitamin C truly does work to lower copper levels in the

body, then that would appear that such an effect is highly ***desirable,*** and the only long-term effect of chronic high doses of vitamin C on copper levels would be keeping them ***less elevated***, but never causing widespread deficiencies. Furthermore, such data also supports the concept that truly copper-deficient individuals, except under the most extraordinary of circumstances, ***do not exist***.

**Always look for the longevity (all-cause mortality) studies to get the clearest picture of the ultimate impact of an agent on the human body.**

**The mortality and longevity data demonstrate the toxicity of excess copper in the body. Excessive copper intake has been correlated with higher risks of death and cardiovascular disease.**[121] **Furthermore, serum copper and ceruloplasmin levels have been *independently associated* with increased all-cause mortality.**[122-124]

The clear-cut conclusion is simply this:

**Never supplement copper.**

Iron, a transition metal like copper, reliably increases oxidative stress wherever it is found in its free, unbound state. Much, perhaps most, of the increased oxidative stress from iron results from an upregulation of the Fenton reaction throughout the body. While bodywide copper excess is easily inferred in nearly everyone from the data discussed above, it is not as easy to establish the presence of such an excess through blood testing. On the other hand, excess iron in the body is reliably reflected in the ferritin blood test.[125-126]

Ferritin is an intracellular protein that stores iron, releasing it into the body's circulation as needed. Higher ferritin levels indicate a high iron content in the body. However, in certain conditions, often due to inflammation secondary to acute infec-

tions, the numbers on this test can increase dramatically without reflecting an actual increase in iron levels in the body. This occurs since ferritin is an acute-phase reactant (an inflammation marker that displays significant changes in serum concentration during inflammation), representing a leakage product from damaged and dying cells.[127] Severe infections can result in significant elevations in ferritin levels, as seen in advanced COVID-19 patients.[128]

While counterintuitive, serum iron levels have little to no consistent correlation with the amount of excess iron stored in the body. However, as more unbound ("free") iron enters the body over the amount of iron needed to sustain normal metabolic needs, the more the synthesis of ferritin is stimulated, and the excess iron is promptly stored inside the shell-like structure of the ferritin molecule until needed for metabolic use.[129] The nonferritin pool of iron includes heme and heme-containing proteins, iron-sulfur complexes, and other iron-containing enzymes.

Not surprisingly, as free iron is a common culprit in stimulating excess oxidative stress, the presence of extra oxidative stress itself results in the synthesis of more ferritin, allowing the excess free iron, which is pro-oxidant, to be removed from the involved tissues.[130] Higher ferritin levels not only indicate increased stores of iron in the body, but they also indicate an ongoing attempt by the body to synthesize enough ferritin to keep extracellular and intracellular levels of free iron at nontoxic or less toxic levels. When free iron levels are minimal, ferritin levels can drop significantly, as they primarily serve as a buffer against excess iron.

Iron excess is so prevalent worldwide (except in extremely malnourished countries in the third world) that the LabCorp laboratory reference range for ferritin is 30-400 ng/mL. The reference range for any laboratory test makes the basic flawed assumption that most individuals in a group will have a result that falls within normal limits and that the reference range will contain mostly

healthy individuals in a given population. However, when a condition affects nearly everyone being tested, the reference range has no direct bearing on normalcy at all. As will be shown, the LabCorp ferritin reference range encompasses ***no normal levels,*** as any ferritin measurements above the 25 ng/mL mark indicate the beginnings of excess iron accumulation. The true "normal" range for ferritin, which is seen mainly in children and younger menstruating females, runs roughly from 15 to 25 ng/mL. However, lower levels can still be normal when no anemia is present.

The incessant addition of iron into all "enriched" foods has rendered most of the adult population iron toxic to some degree. Any abnormal elevation of ferritin ensures some degree of increased cellular oxidative stress throughout the body. It is essential to realize that a normal hemoglobin level (no anemia) means you have enough iron in your body. Under such circumstances, no supplemental or prescription iron should be taken. And do not worry about having a ferritin level that is "too low." If you have enough iron to make all the blood you need, you have more than enough to take care of any other metabolic cofactor needs served by iron in your body.

A ferritin level of 50 ng/mL is considered normal by many physicians, with some even regarding this level as too low. Phlebotomy (blood donation) has been clearly shown to lower iron stores in the body and lessen laboratory parameters of lipid peroxidation and oxidative stress, thereby decreasing the incidence of heart disease.[131-134] Studies examining reduced iron stores after blood donation show that ferritin levels of 50 ng/mL, while not drastically elevated, are nevertheless associated with a deterioration of a critical vascular function. The ability of blood vessels to dilate (or relax) was shown to be significantly better in blood donors who averaged ferritin levels of 17 ng/mL compared to those with ferritin levels of 52 ng/mL.[135] A similar finding was observed in another study comparing the ease of arterial dilation with ferritin

levels reduced well below 50 ng/mL.[136] Loss of easy dilation is an early finding in patients who develop atherosclerosis and other vascular conditions. Any increase in cellular or circulating free iron rapidly exacerbates oxidative stress, a key contributor to endothelial dysfunction and impaired vascular relaxation.[137-138]

The relationship between heart disease and increased ferritin levels is especially well-established. In both men and women, elevated serum ferritin levels are independently and positively associated with coronary artery disease.[139-140] Even a greater incidence of heart disease is seen in men and postmenopausal women compared with the incidence in premenopausal women, as the regular loss of blood (and iron) stops at menopause.[141] Blood donation reduces the risk of myocardial infarction as well as the complications of extremely high ferritin levels, as is seen with hereditary hemochromatosis.[142-143] The target ferritin level from satisfactory blood donation is less than 50 ng/mL, which brings into question why laboratories could consider frankly dangerous ferritin levels of 300 and 400 ng/mL as being within a reference, or "normal" range. Conversely, heart disease is decidedly rare in impoverished, iron-deficient populations.

**...LabCorp ferritin reference range encompasses *no normal levels*, as any ferritin measurements above the 25 ng/mL mark indicate the beginnings of excess iron accumulation.**

A similar reduction in the incidence of new cancers and cancer-related deaths is seen with serial phlebotomies taken over six years. The average ferritin level in 23 cancer patients who died was 136 ng/mL, while the 77 survivors had an average ferritin level of 84 ng/mL.[144] Another study revealed that reducing iron stores by phlebotomy reduced the risk of cancer and cancer-related mortality.[145] As it turns out, the serum levels of all three toxic nutrients (calcium,

iron, and copper) were significantly increased compared to levels in cancer-free control patients.[146]

Not surprisingly, then, mortality studies reveal the tremendous toxicity of excess iron.

- ✓ Elevated ferritin levels consistently correlate with increased all-cause mortality[147-148]
- ✓ Increased iron intake from meat sources in the diet is also associated with increased all-cause mortality.[149]
- ✓ Elevated serum iron levels have also been independently associated with increased all-cause mortality.[150]

## Metallic iron filings in the food

Now for the shocker. Since the 1940s, the routine "enrichment" of flours, cereals, and grains with iron (along with some B vitamins) began on the premise that the wartime populations of the United States and the United Kingdom were being rationed food, and the overall availability of some essential nutrients was felt to be lacking. In 1942, the U.S. Army decided to purchase only flour with this enrichment. This quickly led to much of the world following the United States' lead in lockstep. And once it started, it never stopped, continuing to this very day.

One significant problem with this is that nobody in the United States who eats even the most faddish of diets has an iron deficiency, and no additional iron of any kind does anything but inflict bodywide oxidative damage to the consumer. The second problem is that the form of iron being added most of the time to these enriched foods is ***metallic iron filings***. Somehow, our public health authorities have decided that consuming pure metal is the best way to prevent deficiencies in chemical compounds related to metals in the body. We cannot metabolize metals in their metallic form (for example, filings of iron, copper, zinc, or manganese).

Plants must first metabolize elemental metals to incorporate them into organic compounds that can be ingested. Bear in mind that ***any*** form of additional iron is not good for you, but consuming iron in its metallic form is especially toxic in maximizing the daily oxidative stress exposure in the gut. As a picture is worth a thousand words, and a video is worth even more, this brief video, filmed roughly 30 years ago, now demonstrates this truly insane addition of metallic iron as being a part of "enriched" food products (and nothing has changed since, as it is very easy for anyone to reproduce it today).

**The average ferritin level in 23 cancer patients who died was 136 ng/mL, while the 77 survivors had an average ferritin level of 84 ng/mL.**

https://www.youtube.com/watch?v=HGbwFtmJOi4&t=75s

Shortly after this video was put online, the following email was received from a woman in Australia. Most significantly, this woman asserted the following in that email:

> **PS: I also enjoyed the video. About 25 years ago, I worked at the Sanitarium company in Australia, and I witnessed them adding about a *cup of iron filings* to the rotating oven every time they processed a batch of new corn flakes. Just plain old iron filings it was.** *[emphasis mine]*

To be clear, far more than enriched cereals have this toxic iron content. Bread, cake, cookies, baking and pancake mixes, pasta, rice, coating mixes for frying and baking, gravies, and many other prepared foods utilizing any enriched flours in their preparation are included. Additionally, in Spanish-speaking countries, the "Ingredients" label on food will indicate that it is "fortificada" (fortified), rather than "enriched." Nevertheless, a healthy diet must

always be comprised of foods completely free of added iron. Such a diet includes fresh meats, fruits, and vegetables, as well as most organic or gluten-free flour products.

And remember the babies! Many baby formulas and cereal products are significantly contaminated with added iron, including many that contain iron filings. Many such formulas also have added fluoride, another significant toxin (see below). Your baby will be best served by making your own formula (many recipes are available online), as well as using a blender to combine the nutrients of various organic fruits and vegetables. Iron and its toxic effects on digestion are so common now that it is considered the "norm" for babies to cramp and get colicky after many feedings. Furthermore, this early life exposure to iron toxicity sets the stage for a leaky gut and all the childhood allergies that plague so many kids today. For mothers who can do so, breastfeeding is the best way to get the baby off to a healthy start in life and at least allow the developing gut to mature a bit before other iron-added foods, which are difficult to avoid, become part of the daily diet.

**Furthermore, this early life exposure to iron toxicity sets the stage for a leaky gut and all the childhood allergies that plague so many kids today.**

Sometimes, economics determines whether iron gets added to a food product. Walmart ("Great Value") baked products are not invariably contaminated with added iron (although most are). Presumably, "enriched" flour is a bit more costly than unadulterated flour, and Walmart shaves every penny possible out of the bottom line. At least it is somewhat reassuring to know that the Food and Drug Administration does not appear to ***mandate*** the addition of iron to food products.

The ONLY time iron should ever be deliberately ingested (and in a proper chemical/nutrient formulation, never as an unrefined, raw metal!!) is under the following two conditions:

1. When a low ferritin is seen (under 20 ng/mL, and
2. A hypochromic, microcytic anemia (characterized by pale and small red blood cells) is present, as this is the only way an anemia secondary to iron deficiency manifests under the microscope.

Once the hemoglobin level returns to normal, the iron prescription should be discontinued. Notably, all forms of iron are toxic, and even when iron is needed to help resolve iron deficiency anemia, it still exerts a toxic impact in the gut and elsewhere.

Iron should ***never*** be taken to "protect" against developing an iron deficiency anemia. Excess blood loss, whether from excess menses or a loss of blood from a gastrointestinal tract cancer, is nearly always the reason for the presence of a low ferritin and a hypochromic, microcytic anemia. The presence of such anemia always necessitates a comprehensive evaluation by the patient's doctor. While a nutritional deficiency of iron is widespread in developing countries, it is relatively rare in the United States.[151]

> **Short of frank chronic starvation, *dietary* iron deficiency *does not exist.***

Incredibly, some of this outrage over adding metallic iron filings may finally be filtering back to the governmental agencies in charge of continuing this process, as the internet now has websites discussing "food grade" iron filings, as if the consumption of "contaminated" iron filings is the real issue. However, in contrast to legitimate iron supplements (which you still do not want added to your food), iron filings are the waste product of the grinding, filing, or milling of finished iron products. Adding these iron waste products to food is a good way to generate revenue from something that would otherwise need to be disposed of at a cost. This delib-

erate iron contamination of the food supply bears strong analogies to what has been happening for a long time with water fluoridation.

**Attempts have been made to redesign these mills to minimize or even eliminate the iron filing contamination in the ground food, as hemochromatosis and even liver cancer have been linked to the ingestion of these iron filings.**

The production of chemical phosphate fertilizers yields a chronic release of water-based "wet scrubber" hydrofluorosilicic acid, which also contains significant levels of lead, arsenic, and mercury. This is removed from the chimneys and stored in open-air cooling lakes, where it is further exposed to airborne contaminants. Incredibly, this is what is routinely used to fluoridate community water supplies. Industry produces millions of gallons of this hazardous waste. Also, it costs thousands of dollars per ton to properly ***dispose*** of this heavy metal-contaminated hydrofluorosilicic acid in an environmentally safe manner. It should come as no surprise, then, that the fertilizer industry is more than happy to be paid for a product they would have had to spend a lot of money on for its proper disposal. Similarly, having a way to make money from another waste product, such as iron filings, makes another industry happy at the expense of public health.

Food grinding mills used throughout the country are known to introduce iron filings into the food being ground for human consumption. Attempts have been made to redesign these mills to minimize or even eliminate the iron filing contamination in the ground food, as hemochromatosis and even liver cancer have been linked to the ingestion of these iron filings.[152] There is no agreement even among the "experts" on the effects of ingested iron filings in the human body. Iron filings will be toxic regardless of their source,

whether deliberately added to a cereal or inadvertently generated from food grinding mills.

The cereal manufacturer, Post, was very revealing when asked about the presence of iron filings in their "Honey Bunches of Oats." A Post Consumer Response Representative made the following response by email:

> **Thank you for the opportunity to respond to your inquiry regarding the iron in Honey Bunches of Oats.**
>
> **Iron is considered a "hard-to-get" nutrient for many people, which is why many cereals are fortified with it. The iron used in the fortification of Post cereals is reduced iron, also known as gray dust. Reduced iron is a mineral salt that is derived from iron. Post uses reduced iron in fortification because it is very stable during processing.**
>
> **Please be assured that fortification of our ready-to-eat cereals is in line with government rules and regulations, as determined by the Food and Drug Administration. We hope you find this information useful.**

Notably, the person responding for Post in the above email was wrong about the nature of gray dust. Gray dust is an even finer form of raw, elemental metal than iron filings. It is not a "mineral salt" compound, which would still be toxic, but less so than grey dust or metallic iron filings, which are pure unreacted metal, which never has a place in man or any other biological organism. The only time man can ingest any metal is after it has been incorporated into a food form of nutrient value by a plant. "Reduced iron," as mentioned in the Post email, means that enough electrons have been restored to ferric or ferrous (3+ and 2+) ionic iron to restore it to its elemental, metallic state (Fe, zero valence).

Some misguided health "experts" assert that the acid in the stomach dissolves the metallic iron and allows it to be absorbed and assimilated. However, basic chemistry does not support such an assertion. Metallic iron + HCl (hydrochloric acid) converts to ferric chloride, a form of iron that is exceptionally toxic, corrosive, and acidic.[153-154] Supplemental iron commonly used is in the form of ferrous sulfate, not ferric chloride. Sufficient ferric chloride ingestion results in significant morbidity and even mortality.

The enthusiasm for increasing iron in the food supply appears to be boundless. Even though most of the developed world now has excess iron inside their bodies for the rest of their lives, genetic food engineering has found a way to modify rice growth so that twofold to threefold increased amounts of iron have been incorporated into the harvested rice.[155]

As all diseases result from the excessive oxidation of biomolecules, it can readily be appreciated how harmful the ingestion of metallic iron filings will be to overall gut health and function, especially when it occurs over a lifetime. No substance promotes excess oxidation wherever it is found more readily than the ferric form (3+) of iron, as occurs in the Fenton reaction. Additionally, when ingested chronically in its metallic form, it can also directly cause a foreign body reaction when the metal fragments are large enough.

**No substance promotes excess oxidation wherever it is found more readily than the ferric form (3+) of iron, as occurs in the Fenton reaction.**

Furthermore, as more ferric chloride is formed from the HCl in the stomach, the stage is set for the nonstop provocation of chronic inflammation in the gut. ***This can manifest itself clinically in nearly all forms and presentations of gut dysfunction, including leaky gut and a chronic pathogen-ridden microbiome.***

An itemized list of the effects of metallic and/or supplemental iron on the health of the human gut is as follows:

- ✓ The metallic iron filings (versus a supplemental form of iron) will reliably result in foreign body reactions when the metal particles are larger, setting up an additional chronic inflammatory response to the oxidative stress induced by the presence of extra iron.
- ✓ A leaky gut results from oxidative damage to the integrity of intestinal barrier cells, leading to the premature absorption of incompletely digested food.
- ✓ The unabsorbed and incompletely digested food results in a slowed gut transit time, further promoting putrefaction over normal digestion, with the chronic production of exceptionally potent pathogen-generated toxins.
- ✓ Incompletely digested foods gain access to the intestinal lymphatic and blood drainage systems, and autoimmune reactions, including food allergies, will reliably result.
- ✓ In addition to incomplete digestion promoting premature absorption, it also results in poorer and less complete assimilation of the quality nutrients, vitamins, and minerals contained in the food.
- ✓ The chronically increased oxidative stress resulting from iron ingestion, along with its uptake by gut pathogens, promotes the proliferation of these abnormal bugs, producing and maintaining an abnormal, toxic microbiome. This can also result in more defined focal infections in different areas of the gut (such as diverticulitis).
- ✓ The increased oxidative stress in the gut also facilitates the appearance of gastric and duodenal ulcers, heartburn and acid reflux, excess gas,

cramping, and both diarrhea and constipation syndromes. Notably, *Helicobacter pylori*, the pathogen now considered the causative agent for many cases of stomach and small intestine ulcers, thrives optimally in environments where iron is most abundant.[156-157]

- ✓ The onsets of Crohn's disease and chronic ulcerative colitis are facilitated and fueled by increased oxidative stress. Iron removal has been shown to help control chronic ulcerative colitis.[158]
- ✓ Celiac sprue and its earliest manifestation, gluten sensitivity, result when a leaky gut is prominent enough and has become chronically established.[159-160]
- ✓ The more abnormal the leaky gut and pathogen-ridden microbiome are, the more that ***every*** disease in the body can be aggravated and worsened. Some diseases are initiated primarily because pathogens and toxins pass through a leaky gut. Furthermore, the greater the amount of available iron, the more likely it is that pathogen-protecting biofilms will be present and persist.[161]

Food allergies were largely unheard of before the widespread poisoning of enriched food with metallic iron filings. As of 1971, about 100 articles addressing food allergy were published on PubMed. In 2023, the phrase "food allergy" yielded over 12,000 articles.[162] Nearly all of this can be attributed to the widespread presence of leaky gut syndrome, for which the incessant ingestion of metallic iron can be considered a significant contributing factor. Peanuts and gluten are proteins that digest sufficiently well when the gut is intact. However, when undigested segments of peanut or gluten protein enter the lymphatics and bloodstream, severe allergic and autoimmune reactions are to be anticipated.[163] In the 1950s and

1960s, a peanut butter and jelly sandwich was not the potentially fatal snack that it is today for many children.

For many adults today, their iron assault began in infancy. For many reasons, breastfeeding is the healthiest way to feed a newborn. However, when electing to bottle-feed, it is essential to realize that it is incredibly challenging to find an infant formula free of added iron.[164] Infant colic will always be more likely to occur when ingesting any iron, whether metallic or not. Additional iron can also work to increase the risk of severe illness and death in preschool children and infants.[165-166]

Furthermore, ingesting excess iron from the start of life is a significant reason why so many people have ***never experienced*** a normal, well-formed bowel movement. Supermarkets and drug stores offer a massive array of pills and potions for every conceivable bowel/digestive problem, a clear visual reminder of how widespread digestive disorders are.

One of the reasons organic and gluten-free food products support good health is that they do not contain added iron. That is the case with probably around 90% of them. The ingredient labels still need to be carefully read, since even these food products are occasionally contaminated with added iron.

Certainly, there is no doubt that many people are very sensitive to gluten in their diet. However, the gut can substantially heal and recover when chronic oxidative stress from iron and other toxins is eliminated or even just significantly curtailed. However, even when toxin ingestion has been stopped, multiple different factors, including improper food combinations and insufficient chewing, still prevent many people from achieving a truly normal gastrointestinal tract. Nevertheless, some gluten-sensitive individuals who can avoid ingested iron and the continued swallowed products of chronic pathogen colonization in the nose and throat, can resolve their condition, along with multiple other gut problems.

Because of the way food is processed, most gluten-sensitive individuals who follow a strict gluten-free diet will also avoid all, or nearly all, foods that have added iron, as companies that exclude gluten from foods generally also exclude iron. Substantive gut healing typically occurs when gluten-sensitive individuals avoid consuming iron and ingesting pathogens. When positive gluten- and gluten-related antibody tests return to normal, it is possible that gluten-containing foods can again be safely eaten upon "re-challenge."

Many factors contribute to achieving and maintaining good gastrointestinal health, which is crucial, as compromised gut health can negatively impact other medical conditions. A significant step toward improving gut health throughout the population will be taken when metallic iron filings are no longer a regular part of many diets in the United States and worldwide. And of course, good gut health goes a long way in supporting and contributing to good body health.

## The Toxicity of Poor Digestion

It is becoming increasingly recognized that a leaky gut with an abnormal microbiome contributes to the development or progression of systemic diseases and promotes the ongoing deterioration of many medical conditions throughout the body. A dysfunctional gut also significantly contributes to various autoimmune diseases. This means it is crucial to address as many factors as possible to support normal digestion and a normal microbiome.[167-168]

Optimal digestion occurs under the following circumstances:

- ✓ Digestive enzymes are present in normal amounts.
- ✓ The intake of beverages during meals, including water, is kept to a minimum, and digestive enzymes are not excessively diluted. Supplemental enzymes can help.

- ✓ Chewing is slow and deliberate, aiming to thoroughly mix the food with salivary enzymes and reduce it to a mushy, semi-liquid consistency before swallowing. (Carbohydrates can be 75% broken down before they reach the stomach when properly chewed.)
- ✓ Food portions should not be excessive in amount at any given meal.
- ✓ Food combining principles must be followed to maintain normal gut transit times. Stasis and slowing of food progression through the gut strongly promote greater food putrefaction and less healthy digestion.
- ✓ Any food putrefaction further supports and sustains a pathogen-ridden microbiome, ultimately leading to a leaky gut.
- ✓ High glycemic foods and sugars (not complex carbohydrates) should be minimized, as they also promote pathogen-overgrown microbiomes.[169-170]
- ✓ Minimize dairy consumption and avoid drinking it as a beverage with meals, as it tends to combine poorly with other foods.

## Food Combining

Normal bowel transit time is the most critical factor in assuring greater digestion and lesser putrefaction or rotting of food. A sluggish, constipated gut will always be toxic. Generally, an individual who has two or more substantial meals per day should have at least two substantial bowel movements per day. Dr. Ivan Pavlov, who won the 1904 Nobel Prize in Physiology or Medicine, was recognized for his work on the physiology of digestion. Nevertheless, his work on the effects of food combining on diges-

tion efficiency has remained largely unknown and may have even been ignored.

Pavlov found that when he fed minced meat to dogs, it took four hours for the stomach to empty into the intestines. When he fed the dogs bread alone, it took 1 ½ hours (90 minutes) to leave the stomach. However, when he fed the dogs the meat and bread together, it took a minimum of ***eight*** hours for the food to exit their stomachs. Bread with meat is one of the most common food combinations eaten worldwide. And in terms of supporting good digestion, this combination is one of the worst.

When poor food combinations are ingested, bowel transit time slows down across the entire digestive tract. The digestive tract cannot move food quickly through one segment of the gut and very slowly in another. Once food finally leaves the stomach, the bowel transit time does not accelerate, especially when subsequent meals have the same poor food combinations. ***Remember that the caboose goes at the same speed as the locomotive***.

While any food can ferment (sugars or carbohydrates) or putrify (protein or fat) given enough time, meat is especially prone to rot when it is trapped too long in the stomach and later in the intestines. Along with all the other factors that can promote an abnormal microbiome, slowly moving food provides pathogens with a longer opportunity to proliferate, thereby worsening the health of that microbiome. And when poor eating habits persist, achieving a truly healthy microbiome—one that is mainly free from pathogens—is extremely unlikely, if not impossible. In other words, constipation is a highly toxic condition and should be avoided at all costs for the support of optimal health.

In addition to eating as nutrient-rich and organic a diet as possible, the quality of the food is ***secondary*** to the quality of digestion in terms of overall health impact. Receiving fewer dietary nutrients has a less negative impact on overall health than exposing the

entire body to an endless stream of toxins generated by bacterial, viral, protozoal, and fungal pathogens in the gut. This means that:

> **Poor-quality foods, when digested perfectly, produce less toxicity and a *lesser negative impact* on the body's health than an optimal, nutrient-rich diet that is digested very poorly, with significant food putrefaction occurring.**

Of course, the ultimate goal is to eat the perfect diet and follow the above principles for optimal digestion, particularly the food combining principles. This allows for the optimal assimilation of ingested nutrients with minimal exposure to gut-generated toxins.

A detailed explanation of food combining can be found elsewhere.[171] The "bare basics" of food combining principles are as follows:

Basic food classifications

1. Starches and complex carbohydrates (not simple sugars)
2. Vegetables and fruits (not high starch-containing vegetables)
3. Meat protein
4. Fruit
5. Significant dairy intake

Basic food combinations

- ✓ Eat #1 with #2
- ✓ Eat #2 with #3
- ✓ Eat #4 by itself and never sooner than two to four hours after a meal
- ✓ Eat #5 by itself and never sooner than two to four hours after a meal

- ✓ Never eat #1 with #3 (unfortunately, the most popular food combination)

For the individual with chronically poor digestion that is unresponsive to a careful combination of foods, the best approach is to ***avoid combining foods altogether***. The digestive system works optimally on one food at a time. Different "mono-meals" can be consumed throughout the day. The same foods that one would typically combine in different meals can still be consumed during the entire day, but just separately. Notably, very few individuals typically eat in this manner, but those with the most severe digestive issues should be aware that there is another option that may provide significant relief. Also, the gut needs time to heal. Some people with compromised digestion may respond well enough to "mono-meals" over time, eventually returning to a more regular eating pattern and tolerating it well.

## Added Nutrition

Regardless of how well one follows the principles of good digestion and food combining, a Total Food Pulverization (TFP) program can substantially enhance the diversity and nutritional content and improve most disease-related symptoms for many individuals. This is not juicing, although juicing is a healthy habit as well. TFP makes the entire blended food drinkable. It does not leave a residual pulp behind, unlike juicing.

Generally, the idea is VARIETY. There is no one "recommended" combination of foodstuffs to utilize. Organic vegetables, fruits, seeds, and nuts can be combined. Examples of such seeds (out of many options) include sunflower, flaxseed, pumpkin, watermelon, chia, black cumin, hemp, and sesame. Whenever available, sprouted and raw seeds or nuts are even better.

All diseases involve nutrient deficiencies, and some have deficiencies that are never effectively addressed, even when eating a

well-digested organic diet. Autism and related neurological disorders can respond very well when this protocol of added nutrition with TFP is followed regularly. Even when consuming a "good diet," it is often impossible to discover the missing nutrients for addressing a particular disease. However, especially in mental and behavioral disorders, less common nutrients have been depleted, and the missing anutrient is never "stumbled upon" by eating the same diet over and over. TFP offers an excellent source of such "uncommon" nutrients.

## Recap

Although most vitamins, minerals, and other nutritional supplements can be taken at high dosages without any significant clinical toxicity, there are a few supplements that can cause severe toxicity even at very small amounts. Calcium, iron, and copper are members of that category and should ***never*** be supplemented except under very limited circumstances. All three of these "toxic nutrients," while necessary at low levels of intake for the health of all cells, rapidly become major contributors to disease-causing excess oxidative stress, even when the ingested amounts are quite small.

Although calcium ingestion through supplementation and dairy products is highly touted by much of the medical community and the dairy industry, anyone with ***any disease*** already has too much calcium inside the affected cells. Supplemental calcium and excess daily intake will only exacerbate the disease conditions and sustain or increase excessive intracellular calcium levels. All-cause mortality increases proportionately with the highest intake levels of total calcium intake (dietary and supplemental) compared to those with the lowest intake levels. The overwhelming conclusion of scientific studies is that calcium should never be taken in supplemental form and that dairy sources of calcium should be minimized.

Even the commonly touted advice that suggests calcium supplementation can help strengthen osteoporotic bones and make them less susceptible to fracture has been disproved by several studies. In contrast, properly dosed vitamin D3 improves bone quality while decreasing the likelihood of osteoporotic fractures.

Supplements that help optimize calcium levels inside the cells and decrease all-cause mortality include vitamin C, magnesium, vitamin D3, and vitamin K2.

Regular iron poisoning is extremely common because many food products are "enriched" with iron, and frequently in the form of metallic iron filings. As a result, most people in the developed world are in a chronic state of iron excess.

Anyone who consumes these iron-enriched foods on a regular basis will have an abnormal gut and an abnormal microbiome, which leads directly to a host of bowel problems and other syndromes related to a "leaky gut." Diligent reading of all "Ingredients" food labels can eliminate this particular toxin exposure completely.

Copper also becomes toxic when the necessary quantities are exceeded, even by the smallest amount. Neither iron nor copper is readily excreted by the bowels or kidneys, and they continue to be recycled in the body, so they do not need to be regularly replenished. For these reasons, neither iron nor copper should be supplemented.

Poor digestion is a major, and often unrecognized, source of toxin exposure for much of the population. Most medical conditions will not respond well to treatment until patients' digestion is improved through proper eating, healing leaky guts, and remediating pathogen-ridden microbiomes. Until these issues are confronted, affected individuals will remain sick for life.

## Chapter 4

*Think for yourself, or others will think for you without thinking of you,*
Henry David Thoreau

# Spike Protein: The Unsuspected Toxin

## A Pandemic of Induced Sickness and Death

Although the mainstream media outlets might have you believe otherwise, the vaccines that continue to be administered for the COVID pandemic have emerged as very substantial sources of morbidity and mortality themselves. While the severity and frequency of these adverse outcomes can be debated, there is no question that enough deaths and chronic diseases have already occurred to warrant cessation of the COVID-19 vaccine administration. And, they should not be resumed until additional *scientifically based research*, free of agenda bias, can examine the balance between its now clear-cut side effects (often fatal) versus its potential (and still not yet clearly proven) ability to prevent new COVID infections. Of course, all new vaccines for emerging pandemics and epidemics must meet the same rigorous standards of testing and evaluation. All drugs undergo safety testing, usually to an extensive degree, and a vaccine is a drug, as a drug is defined as

a substance used in the diagnosis, treatment, or prevention of a disease. Continuous propaganda on the benefits of vaccines should not make them exempt from proper safety testing.

**Spike protein, by itself, without associated COVID-19 viral encapsulating proteins, has been found in the brain and heart following the COVID-19 shot, indicating that the *vaccine*, rather than the COVID-19 infection, was the source.**

Nevertheless, enough COVID vaccinations have already been administered to make it clear that a new "pandemic" of illness and death is emerging from the side effects — adverse effects that continue to be documented in steadily increasing numbers. The vaccine-induced "culprit" that is now receiving the most attention and is the focus of much ongoing research is the COVID-19 virus fragment known as the spike protein. Its physiological impact appears to be doing far more harm than good (supposedly antibody induction against the entire COVID pathogen). Furthermore, the direct introduction of the spike protein via the vaccine often results in its ongoing replication, leading to a prolonged presence within the body for an ***i**ndefinite* period.

Whether caused by a primary infection or the vaccine, persistent spike protein (PSP) syndrome is essentially the same.[1-3] However, COVID booster shots can often increase the levels of spike protein so rapidly and substantially that complications rapidly develop even though they did not appear after earlier boosters or following the resolution of an acute COVID infection. Furthermore, PSP syndrome is often much more pronounced and advanced in symptomatology following one or more COVID injections versus just following contraction of the infection. Spike protein, by itself, without associated COVID-19 viral encapsu-

lating proteins, has been found in the brain and heart following the COVID-19 shot, indicating that the ***vaccine,*** rather than the COVID-19 infection, was the source.[4] This appears to be ***much*** more common than is acknowledged by mainstream science.

## Spike Protein Physiology

Spike proteins are the spear-like appendages surrounding the "porcupine-like" COVID pathogen. They attach to the target cells and break down the cell membranes with dissolving enzymes that permit the pathogen to enter the cell, where it is then able to multiply freely.[5-6] When the spike protein presence following a bout of COVID or a COVID-19 vaccination does not entirely resolve, a persistent spike protein (PSP) syndrome ensues. PSP syndrome is also referred to as chronic COVID or long-haul COVID.

Spike protein is itself a toxin, which means that at least part of any treatment protocol for PSP syndrome must involve an increased intake of antioxidants to repair the biomolecules that spike protein has oxidized, as well as to directly neutralize the toxicity of spike protein, as discussed in Chapters 1 and 16. This is important, as the spike protein has been shown to induce oxidative stress directly, even ***in the absence*** of a COVID-19 infection.[7]

> **Studies show that even fragments of the spike protein are toxic and highly pathogenic.**[8-10]

Notably, the toxicity and pathogenicity of the SARS-CoV-2 coronavirus-related spike protein were documented long before the COVID-19 pandemic.[11-12] In an animal study, not only was a vaccine expressing the SARS-CoV-related spike protein ***unable*** to protect against the targeted pathogen, but it also elicited a strong inflammatory response, with necrosis observed in the liver. In contrast, unvaccinated animals exposed to the pathogen showed no clinical symptoms, further questioning the actual physiological role played by the vaccine.[13]

As the acute cases of COVID have continued to decline, the prevalence of the PSP syndrome has continued to increase. This is because the spike protein can bind to ACE2 receptors throughout the body, potentially allowing it to establish itself in any part of the body. There appear to be no cells, tissues, or organs in the body that are completely spared from this PSP attack once a sufficient amount has been introduced into the body. This also means that PSP has no typical clinical presentation, as no two patients have the same tissues affected to the same degree by the spike protein.[14-15] The prevalence of PSP now is enormous, with 5% to 10% of patients who survive a COVID infection ending up with a chronic COVID or PSP syndrome. When this large number of post-COVID PSP patients is added to those who had received the COVID jab(s) and contracted PSP despite never having reported an acute COVID infection, the total number of people on the planet with an ongoing presence of spike protein in their bodies is ***astronomical***, perhaps in the hundreds of millions.[16-17]

**There appear to be no cells, tissues, or organs in the body that are completely spared from this PSP attack once a sufficient amount has been introduced into the body.**

Receiving COVID shots before or after a bout of COVID can promote higher spike protein levels, and these elevations are often ***sustained***. Furthermore, the high spike protein levels frequently observed in post-vaccination individuals can persist for an indefinite period, as the cells that have assimilated the mRNA from the injections often continue to produce spike proteins.[18-19]

**The spike protein must now be considered one of the most potent and prevalent toxins on the planet; therefore, *all patients* should be evaluated and**

**treated with the possibility that the spike protein is part of the clinical problem being addressed.**

The spike protein first attaches to ACE2 (angiotensin-converting enzyme 2) receptors in the cell membranes.[20] This initial binding step is crucial for triggering the subsequent sequence of events that enables the virus to enter the cell. When this binding is blocked by competition or prompt enough displacement with an appropriate therapeutic agent, the virus cannot enter the cell, the infectious process is effectively stopped, and the immune defenses of the body are freed to mop up, metabolize, and eliminate the viral pathogens, or just the spike protein alone if free and no longer attached to a viral particle.

Although they are found on the cells of many different tissues and organs throughout the body, the ACE2 receptors on the epithelial cells lining the airways are the first targets of the spike protein surrounding the COVID-19 pathogen upon exposure by inhalation.[21] Notably, the concentration of these receptors is particularly high on lung alveolar epithelial cells, leading to a disproportionate degree of pathogen attraction to the lung tissue and explaining why the earliest cases of COVID consistently displayed significant respiratory distress at the onset of the infection.[22-23] Additionally, an even higher ACE2 expression is observed in the olfactory epithelial cells, which accounts for the commonly reported loss of smell and taste associated with COVID infection.[24]

When sufficient pathogen binding to these ACE2 sites in the lungs occurs and pathogen replication ensues within those cells, the unchecked process eventually leads to the adult respiratory distress syndrome (ARDS), low blood oxygen levels, and the burst of oxidation known as the cytokine storm, ultimately leading to death shortly thereafter.[25] This was a prominent characteristic of the initial COVID-19 cases in 2020, but became much less pronounced as other COVID-19 strains emerged.[26]

As ACE2 receptors are present in many tissues throughout the body, circulating spike protein free of the COVID-19 pathogen can become bound just about anywhere. Increased thrombosis (abnormal blood clotting) has been observed in individuals with chronic COVID-19 and in those who have received the COVID-19 shots, which produce the free spike protein. The binding of spike protein to ACE2 receptors on both platelets and the cells lining the blood vessels (endothelium) is responsible for an increased chance of thrombosis.[27-29] With the spike protein involving both the blood vessel walls and the platelets themselves, the propensity to blood clotting is synergistically increased versus just binding one or the other. This suggests that PSP patients with free spike protein in the circulation are more likely to develop thrombotic complications than those with persistent spike protein presence within the cells but not in the blood.[30]

**Depending on the cell types to which such spike proteins bind, a wide variety of diseases with autoimmune qualities can result.**

When free spike protein (versus spike protein bound to the COVID pathogen) binds ACE2 receptors but does not proceed any further into the cell, the normal ACE2 function in the given tissue can be blocked or impaired. This is an additional factor that helps to explain the great diversity in the clinical presentation of PSP syndrome or chronic COVID. Additionally, when the spike protein binds to a cell wall and "stops" there, the spike protein can serve as a hapten (antigen), which can then initiate an autoimmune (antibody or antibody-like) response to the cell itself in addition to any immune response to the spike protein. Depending on the cell types to which such spike proteins bind, a wide variety of diseases with autoimmune qualities can result. Because of this, measuring ANA (antinuclear antibody) levels can be an additional way to track treatment progress in PSP patients.[31] ANA levels are commonly

used to monitor the activity of autoimmune diseases, as well as the activity of specific acute and chronic infections.[32]

The spike protein has been found enveloped in exosomes, whether introduced by the COVID infection or by COVID inoculations.[33-35] Exosomes are nano-sized (roughly 30 to 200 nm) entities wrapped in the ***same wall structure*** as a natural cell, and they are the smallest of the extracellular vesicles.[36] Extracellular vesicles are essential, naturally occurring players in intercellular (cell-to-cell) communication, including the conveyance of an immune response.[37-38] They are found in all body fluids that have been tested.[39-41] Exosomes can deliver their contents into cells both by passing through some of the larger pores in some cells, as well as by a reverse pinocytosis (the process of vesicle ingestion into cells by merging with the cell wall) allowing the exosome to directly deliver those contents into the cytoplasm as it becomes part of the cell wall.[42-43] When present inside the cells after passage through cell pores, the exosomes are then free to merge with the intracellular organelles, which have the same wall structure as the exosomes and the cell wall.[44-46]

The purported purpose of the COVID injection is to introduce mRNA that codes for the production of the spike protein, which then allows the immune system to react and produce antibodies to the spike protein, thereby facilitating an immune response against the entire COVID pathogen. However, it has been asserted that following the injection, the body will somehow clear out any residual spike protein left after the immune response has been triggered. Claims have been made that the injection contents remain where they are injected in the shoulder muscle, never disseminating. Unfortunately, this is not always the case, as numerous individuals have been unable to clear the spike protein after its mRNA-induced production in the body, resulting in its subsequent spread to tissues throughout the body.

The transport of spike protein in exosomes not only keeps it around, it also "protects" it more effectively from further immune attacks than if it were circulating freely in the blood and more readily eliminated by various means. Exosomes containing the spike protein can also facilitate the delivery of the spike protein into cells, where it can then be replicated. The immune cells exposed to the spike protein appear to be especially capable of releasing large numbers of spike protein-containing exosomes.[47] Also, the presence of spike protein inside exosomes has been directly established, as ***exosomes containing spike protein have been visually identified in the cytoplasm of COVID-infected human heart cells***.[48]

Once significant spike protein production has occurred inside the cell after entry from primary infection or by the mRNA injection, much of the spike protein becomes encapsulated in exosomes or slightly larger extracellular vesicles. It is then released from the cell by exocytosis, and the spike protein can spread throughout the body.[49] When the COVID-infected cell eventually lyses or ruptures, some free, unencapsulated spike protein is released as well. However, it is the presence of the spike protein inside circulating exosomes and within cells, which are later released, that allows the spike protein to remain present indefinitely in many patients with PSP. Hypoxia, a characteristic of many infected cells, also induces the release of exosomes from the cytoplasm.[50-51] However, it is not uncommon for PSP patients to have no detectable free spike protein circulating in the blood. Yet, the clinical picture indicates an ongoing toxic impact of the spike protein.

The spike protein is unique in that it is not only a toxin that causes the expected oxidative damage, but it can also maintain its ***indefinite*** presence in the body by making more copies of itself. Toxins generally do all their oxidative damage on a "one-time" basis. The idea of any significant toxin being able to produce more copies of itself makes a complete clinical recovery unlikely, as is precisely

the case with PSP or chronic COVID, which affects many ***millions*** of people around the world.

Spike protein-filled exosomes also explain the shedding phenomenon in which seemingly minimal casual contact can result in COVID-like symptoms in the newly exposed person. As exosomes leave the cells, they can then enter the lymphatic system and eventually the bloodstream, and they can reach the extracellular fluid surrounding the cells lining the lungs, where they are disseminated in exhaled breath. They can also reach the lymph and extracellular fluid that ultimately gets expressed in sweat, another source of external exposure to another person. Once inside that individual, the exosomes can enter new uninfected cells and begin replicating. Pfizer's internal documents advise about the possibility of "environmental exposure" by "inhalation or skin contact" of the mRNA in the vaccine being transmitted from a vaccinated individual to another person.[52]

**The spike protein is unique in that it is not only a toxin that causes the expected oxidative damage, but it can also maintain its *indefinite* presence in the body by making more copies of itself.**

Sudden death resulting from PSP is the most critical concern for anyone with chronic COVID or who has had one or more COVID shots. Except for cases of acute thrombosis (especially in the brain or lungs), virtually all sudden death comes from heart arrhythmias of patients with PSP. The COVID shots have now been shown to correlate with an increase in cardiac deaths in those who have received them. This effect has been most prominent in men.[53] Autopsies on multiple vaccinated individuals who died shortly after receiving their shots revealed that acute myocarditis was the only logical cause of their deaths.[54] Fatal arrhythmia from such myocar-

ditis will account for far more deaths than from the rapid development of a congestive cardiomyopathy.

## Why Spike Protein Persists

PSP syndrome is now widespread, but its clinical presentation is not typical or well-defined. There is considerable variability in the location and concentration of the spike protein in a given patient. This results in an enormous ***underdiagnosis*** of PSP syndrome, as no two patients have the same spectrum of symptoms. Any patient with any symptom profile who remains undiagnosed should be considered as having PSP syndrome and treated with the best available treatment protocols for that condition. PSP syndrome means that there is a continued presence of spike protein, whether in the blood, cells, lymph, or extracellular fluid, or other bodily fluids, and it commonly is seen under the following circumstances:

- ✓ When there is a diagnosis of chronic COVID, which is just an acute COVID infection that the body was unable to resolve completely
- ✓ Following primary COVID shots and booster shots. This is the most common source of high spike protein levels in the body. The shots deliver mRNA that is designed to produce the spike protein, rather than just providing a one-time exposure to the spike protein to elicit an immune response to it. Early assertions that the spike protein would remain at the injection site (usually the deltoid muscle) were utterly wrong. Autopsy studies after COVID-19 and following recent vaccinations have shown that the spike protein has disseminated throughout the body.
- ✓ New COVID infections that are minimally symptomatic to asymptomatic. The existence of this subset of infections is another reason to check D-dimer levels in everybody, the elevation of which

is still possible in any patient with any degree of persistent spike protein, especially in the blood.

- ✓ Exposure of an uninfected individual to the spike protein-laden exosomes in breath, saliva, and sweat from an infected individual.
- ✓ Spike protein multiplication inside some cells in the absence of the entire COVID-19 pathogen.

The goal of any therapy designed to eliminate a PSP presence in the body needs to address:

- ✓ Its possible presence in the blood
- ✓ Its possible presence on the many ACE2 binding sites throughout the body
- ✓ Its possible presence inside the cells, whether in exosomes or a free state
- ✓ Mechanisms that allow it to replicate itself and keep it from being eliminated from the body.

It has been shown that the sickest patients with PSP have intact spike proteins ***circulating*** in their blood.[55] However, a PSP or chronic COVID patient will not necessarily always have circulating free spike protein in their blood while still being very ill and showing no significant improvement over time. Some of these patients have a substantial presence of exosome-encapsulated spike protein in the circulation or the persistence of intracellular spike protein.[56]

However, eliminating spike protein from the blood does not assure a cure, since it is essential for the spike protein to be eradicated wherever it is found, including inside the cells where the intact virus is replicating and persisting. For a PSP patient, it is also vital that any persisting vaccine-supplied mRNA that can program the production of more spike protein can be effectively targeted as well. Otherwise, the organs and tissues that can readily regenerate could eventually eliminate all spike protein. In contrast, organs

with little to no significant regenerative capacity may become reservoirs for this toxic protein and the mRNA that can generate it. Multiple autopsy studies have revealed the presence of spike protein throughout the body, with no particular areas spared.[57-58]

**This results in an enormous *underdiagnosis* of PSP syndrome, as no two patients have the same spectrum of symptoms**

PSP is linked to the inability to completely resolve a bout of COVID (chronic COVID or long-haul COVID) or the failure to eliminate the spike protein exposure from mRNA COVID inoculations.

And as more time has passed since the pandemic started, the PSP syndrome following one or more mRNA shots has emerged ***as the most common reason*** for PSP, especially following a booster injection, rather than just a chronic unresolved COVID infection.

Not surprisingly, the likelihood of developing a PSP syndrome is directly related to the total amount of spike protein exposure, and the amounts effectively delivered by repeated inoculations substantially exceed those resulting from incompletely resolved cases of COVID.[59] Stronger adverse reactions following inoculations correlated with higher spike protein antibody responses.[60]

While the totality of the mechanisms involved is far from being completely understood and worked out, the increasing occurrence of severe post-vaccine clinical complications is nevertheless very clear-cut. It must be addressed as rapidly and effectively as possible. By itself, the binding (or effective "blocking") of ACE2 receptor function by spike protein in different areas of the body has resulted in a multiplicity of symptoms and side effects.[61] Such clinical complications, observed in various organ systems and body areas, can occur in

three distinct clinical situations. All three are PSP syndromes, although the acute infection always includes the entirety of the virus particles along with the spike protein during the initial phases of the disease. These clinical presentations can occur:

- ✓ During an active COVID-19 infection,
- ✓ During the PSP or chronic COVID syndrome, or
- ✓ In response to vaccines, including boosters, that rapidly increase spike protein levels in the body

Any of these PSP syndromes can result in a wide array of clinical consequences, including the following:

- ✓ Heart failure, heart injury, heart attack, myocarditis[62-63]
- ✓ Pulmonary hypertension, pulmonary thromboembolism and thrombosis, lung tissue damage, possible pulmonary fibrosis[64-68]
- ✓ Increased venous and arterial thromboembolic events[69]
- ✓ Diabetes[70-71]
- ✓ Neurological complications, including encephalopathy, seizures, headaches, and neuromuscular diseases. Also, hypercoagulability and stroke[72-75]
- ✓ Gut dysbiosis, inflammatory bowel disease, and leaky gut[76-78]
- ✓ Kidney damage[79]
- ✓ Impaired male reproductive capacity[80]
- ✓ Skin lesions and other cutaneous manifestations[81]
- ✓ General autoimmune diseases, autoimmune hemolytic anemia[82-83]
- ✓ Liver injury[84]
- ✓ Development of many different cancers

Consistent with the list of clinical conditions associated with PSP listed above, tissue and autopsy studies have documented the presence of the spike protein or the immune response to it in numerous tissues and organs. It is doubtful that any tissue in the body is spared. However, there can be different degrees and sites of spike protein infiltration in patients with chronic COVID-19 and those who have received post-COVID vaccination. The cells lining all blood vessels are subject to invasion and persistent presence of the spike protein. The spike protein has been documented to invade the following:

- ✓ Tongue mucosa.[85] This means that the COVID pathogen can be present in the form of a chronic pathogen colonization (CPC) in and on the tongue.
- ✓ Salivary glands (also a CPC site)[86]
- ✓ Throat ulcers (also a CPC site)[87]
- ✓ Axillary lymph nodes[88]
- ✓ Heart[89]
- ✓ Intestine[90]
- ✓ Skin, including subcutaneous areas[91]
- ✓ Lungs[92]
- ✓ Larynx[93]
- ✓ Brain and central nervous system[94]
- ✓ Native kidney, kidney transplant, nephrotic syndrome[95-97]
- ✓ Liver[98]
- ✓ Thyroid gland[99]
- ✓ Spleen[100]
- ✓ Eye tissues[101]
- ✓ Carotid body[102]
- ✓ Seminal plasma[103]

In structuring a clinical protocol to stop the ravages of PSP presence throughout the body, it is important first to realize that the protocol should be able to effectively treat all aspects of an active COVID infection, as well as the ongoing spike protein presence secondary to either chronic COVID or resulting from COVID vaccine administration(s).

As is the case with any treatment for any condition, factors of expense, availability, and patient compliance always play a role in determining what treatment a given patient will undergo for a given period. As such, no single protocol will be suitable for all patients, even if the same pathology is present. Ideally, the best protocol is to utilize all the options discussed below. When the entirety of the protocol is not possible or feasible, which is most often the case, a combination of hydrogen peroxide (HP) nebulization, one or more bio-oxidative therapies, including high-dose vitamin C, and appropriately dosed ivermectin is an excellent way to effectively address long-haul COVID and persistent spike protein syndromes.[104]

Much of the rationale behind the design of the protocols is based on what is known about the spike protein and its mechanism of causing harm. The following aspects of spike protein pathophysiology need to be considered in crafting an optimal treatment protocol:

- ✓ The ongoing production of spike protein by the vaccine-supplied mRNA into the cells[105]
- ✓ The binding of the spike protein, with or without an attached COVID pathogen, to an ACE2 binding site on the cell wall, as an initial step to dissolving that portion of the cell wall, permitting the spike protein (and attached pathogen if present) to enter the cell
- ✓ The binding of the spike protein to an ACE2 binding site, but just ***remaining bound*** to that site and not initiating enzymatic degradation of the cell wall, with or without an attached pathogen, and blocking the ACE2 function seen when it is normally active.

- ✓ The degree to which the circulating spike protein is present in the blood and is actively disseminating throughout the body
- ✓ The fact that the spike protein by itself is toxic (pro-oxidant in nature) and capable of generating disease-promoting oxidative stress throughout the body. This is addressed most directly by persistent and highly dosed vitamin C.
- ✓ Whether the PSP presence has resulted in a hypercoagulable state, as would be reflected in an elevated D-dimer level

Sufficient spike protein binding to ACE2 receptors on the endothelial cells lining the blood vessels consistently results in increased blood clotting. Such clots are often tiny in some individuals, which can then lead to varying degrees of tissue and organ damage, depending on the severity of overall blood flow impairment to those areas.[106-107] Other clots can rapidly increase in size and result in sudden death.[108] Spike protein can also activate blood clotting by binding directly to the ACE2 receptors of platelets in the blood. Furthermore, circulating spike protein ***that has not yet been bound*** appears to stimulate hypercoagulation as well.[109]

## D-dimer Levels

The chances of life-threatening blood clots developing are increased when D-dimer levels are elevated, and normalizing this test must be a top priority in all patients. D-dimer levels are consistently elevated in chronic COVID patients and especially in vaccinated individuals with any thrombotic complications. Abnormal D-dimer levels indicate an increase in the breakdown products of blood clots, further suggesting that excessive blood clotting is already occurring. Fully 12% of 720 subjects receiving a spike protein-producing vaccine promptly elevated their D-dimer

levels.[110] Inducing an abnormal clotting status in any patient at any time is never desirable and should never be part of a "normal" vaccination response. Patients with higher D-dimer levels for more extended periods were sicker and subject to a greater chance of death.[111-114] In critically ill COVID ICU patients, elevated D-dimer levels were present roughly 60% of the time.[115]

> **Autopsy reports have shown that 80 to 100% of COVID-19 patients have microthrombi (tiny blood clots) throughout their bodies.**[116]

D-dimer levels can be elevated in pregnancy, trauma, post-operative periods, inflammatory reactions, and cancer. Except for an advanced cancer, such conditions are not permanent, meaning that the D-dimer should never remain elevated indefinitely, as it always indicates an increased chance of developing blood clots, regardless of the underlying condition. In COVID patients, elevated D-dimer levels correlate with a greater chance of death.117 Having any degree of chronically increased blood clotting is always of consequence, indicating significant ongoing pathology in the body with an increased chance of life-threatening thrombi (blood clots) occurring at any time. Even a minimally elevated D-dimer should not be ignored by the clinician in constructing an optimal treatment protocol.

Platelets, the elements of the blood that can get sticky and both initiate and help grow the size of blood clots, will generally demonstrate declining levels in the blood at the same time D-dimer levels are increasing, since their stores are being actively depleted. A post-vaccination syndrome known as vaccine-induced prothrombotic immune thrombocytopenia (VIPIT), characterized by these very findings, has been described.[118-120] Vaccinations have also been documented to cause bleeding syndromes due to autoimmune reactions resulting in low platelet levels.[121]

This can create some confusion clinically, as chronically low platelet levels by themselves can promote clinical syndromes of increased bleeding rather than increased blood clotting. As such, some primary low platelet disorders require pro-coagulation measures to stop bleeding, while other conditions featuring primary increased thrombosis with the secondary rapid consumption of platelet stores ultimately need anticoagulation measures to halt the continued consumption of platelets.[122] Significant thrombosis post-vaccination in the absence of an elevated D-dimer level or low platelet count has also been described.[123] In platelets taken from COVID patients, platelet stickiness predisposing to thrombosis has been shown to result from spike protein binding to ACE2 receptors on the platelets.[124]

**Autopsy reports have shown that 80 to 100% of COVID-19 patients have microthrombi (tiny blood clots) throughout their bodies.**

Notably, a D-dimer test that is elevated due to increased blood clotting typically remains elevated for only a few days after the underlying pathology that provoked the blood clotting has been resolved. Chronic COVID infections often demonstrate persistent evidence of blood clotting pathology. This is ascribed to PSP in blood and/or tissues. In one study, 25% of convalescent COVID patients who were four months past their acute COVID infections demonstrated increased D-dimer levels. Interestingly, these D-dimer elevations were often present when the other common laboratory parameters of abnormal blood clotting had returned to normal.[125]

Under conditions of inflammation and systemically increased oxidative stress, red blood cells (RBCs) can aggregate to varying degrees, sometimes adhering together like stacks of coins, with branching of the stacks observed when the stickiness is at its

maximum. This is known as the Rouleaux formation of the RBCs.[126] When this Rouleaux formation is pronounced, increased blood viscosity (thickness) is seen, and there is increased resistance to the normal, unimpeded flow of blood, especially in the microcirculation.[127-130]

Regarding the smallest capillaries through which the blood must pass, it needs to be noted that individual RBCs need to bend slightly to pass from the arterial to the venous side, as the capillary diameter at its narrowest point is less than the diameter of a normal RBC, or erythrocyte. Any aggregation of the RBCs, as is seen with Rouleaux formation, will increase resistance to normal blood flow, and it will be more pronounced as the caliber of the blood vessel decreases. Not surprisingly, Rouleaux formation of the RBCs is also associated with an impaired ability of the blood to optimally transport oxygen, which is another notable feature of the COVID spike protein's impact.[131] Increased RBC aggregation has been observed in several different microcirculatory disorders, and it appears to be linked to the pathophysiology in these disorders.

Rouleaux formation is easily visualized directly with dark-field microscopy. When available, feedback is immediate, eliminating the need to wait for a laboratory to process a test specimen. It is a reliable indicator of abnormal RBC stickiness and increased blood viscosity, typically elevating the erythrocyte sedimentation rate (ESR). This acute-phase reactant test consistently increases along with C-reactive protein in a setting of generalized increased oxidative stress throughout the body.[132-133] As such, it cannot ever be dismissed as an incidental and insignificant finding, especially in the setting of a symptom-free individual post-vaccination who appears to be normal and presumably free of widespread increased inflammation and oxidative stress. States of advanced degrees of increased systemic oxidative stress, as often seen in cancer patients, can also display Rouleaux formation among circulating neoplastic cells, not just RBCs.[134]

Persistent evidence of blood clotting (increased D-dimer levels) in chronic COVID patients appears to correlate well with the persistent presence of ***circulating*** spike protein. Rouleaux formation of red blood cells, as observed under dark-field microscopy, also appears to correlate with the presence of spike protein in the blood. However, the degree of correlation between an increased D-dimer level and Rouleaux formation of the RBCs remains to be definitively determined. Certainly, the presence of both should trigger the greatest concern for the development of significant chronic COVID and post-COVID vaccination complications, especially concerning abnormal blood clot formation. Infusions of vitamin C and ozonated saline solution have been shown to promptly normalize advanced degrees of Rouleaux formation. A series of ozone treatments of the blood has also resolved Rouleaux formation.[135] Whether this means these measures have resolved PSP remains to be determined.

Everyone needs a baseline D-dimer test just as much as they need a baseline glucose or a hemoglobin test. You don't know if it's abnormal until you examine it. If it is normal, then great; you have a result that can be used for comparison in the future if you become ill without knowing why. Chronic COVID and PSP can cause very minimal to very severe illness, and it is vital to know as early as possible whether there is an increased chance of thrombotic complications in a new-onset clinical syndrome.

D-dimer levels are typically regarded as elevated when they exceed 0.5 mg/L (500 ng/mL). Even if the patient is feeling better or feels completely well, vigorous anti-COVID measures should continue until the D-dimer levels drop below 0.5 mg/L, unless the patient has another condition known to be associated with elevated D-dimer levels. Furthermore, the way laboratories establish reference ranges or "normal" levels makes a goal of reaching a D-dimer level of 0.35 mg/L or less a more desirable goal, with increased assurance of having achieved true normalcy.

## Therapeutic Agents and Their Mechanisms

A substantial number of agents have already been found to be highly effective in resolving COVID-19 infections, and even more are being discovered as worldwide research efforts intensify their focus on curing this infection.[136] Some of the most effective agents and their mechanisms of action include the following:

1. ***Hydrogen peroxide (HP) nebulization***. Correctly applied, this treatment eliminates the presence of acute COVID-19 pathogens in the nose and throat, as well as any chronic pathogen colonization that persists in the aerodigestive tract. Additionally, a positive healing effect on a leaky gut and a pathogen-overgrown microbiome is typically observed, as fewer pathogens and their associated pro-oxidant toxins are chronically ingested.

   Stunning anecdotal evidence indicates that HP nebulization has successfully treated even ***advanced*** COVID-19 infections (20 out of 20 cases) as a ***monotherapy***.[137] All supporting research, scientific analysis, and practical suggestions on this therapy are available as a complimentary eBook download, [***Rapid Virus Recovery***].[138]

2. ***Vitamin C***. Vitamin C works synergistically with HP in eradicating pathogens. It provides strong general immune support while promoting the optimal healing of damaged cells and tissues. Clinically, it is the most potent antitoxin ever described in the literature, and no reports of it failing to neutralize any acute intoxication when administered appropriately have been published. Persistent and high-dose vitamin C in all its forms

will prove to be the ***most helpful intervention*** when a large amount of circulating toxic spike protein is present. Intravenous, regular oral, liposome-encapsulated oral, and regular oral forms (ascorbic acid) of vitamin C taken with oral hydrocortisone are very effective in resolving infections and neutralizing toxins.[139]

Additionally, hydroxytyrosol, a prominent polyphenol in olive products, appears to enable some humans to synthesize vitamin C in their livers, which would be of great benefit in addressing various conditions.[140-141] Hydroxytyrosol even exhibits properties that suggest it may interfere with the binding of the COVID spike protein to cells.[142] Supplementation with metadichol®, a nano lipid form of policosanol, has also been shown to significantly upregulate the GULO enzyme needed for vitamin C biosynthesis, resulting in significantly increased vitamin C blood levels (See Chapter 12).

3. ***Ivermectin, Hydroxychloroquine (HCQ), and Chloroquine (CQ)***. Ivermectin has powerful antiparasitic and antiviral properties. Evidence suggests that ivermectin binds to the ACE2 receptor site, which the spike protein must bind to in order to enter the cell and replicate both the spike protein and the pathogen.[143-144] Additionally, under certain circumstances, the binding of the spike protein to the ACE2 receptor does not activate the enzymes necessary for cell entry. Instead, it remains bound, rendering the receptor unavailable for its normal function. It appears that ivermectin can also displace such bound spike protein from the cell walls when a sufficient dose is taken. Furthermore, studies indicate that unbound circulating spike protein

can be ***directly bound*** by ivermectin, rendering it inactive and making it accessible for metabolic processing and excretion.[145-146] Where the mass administration of ivermectin for parasitic diseases in Africa has been implemented, a significantly lower incidence of COVID-19 infection has also been observed.[147] Ivermectin is also very safe when administered as directed.[148]

Both HCQ and CQ are very effective agents in resolving acute COVID-19 infections. They have also both been shown to be zinc ionophores that can increase intracellular zinc levels. Sufficient zinc levels in the cells can then inhibit the enzyme activity needed for viral replication. Additionally, both HCQ and CQ have been found to block the binding of spike proteins on the COVID-19 pathogen to the ACE2 receptors required for viral entry into cells. This provides scientific support for their utility as they more directly interfere with spike protein activity before the virus ever breaches the cell.[149-151]

4. ***Quercetin***. Like HCQ and CQ, quercetin also serves as a zinc ionophore. And like HCQ and CQ, quercetin also appears to work by blocking the binding of COVID-19 virus spike proteins to the ACE2 receptors, thereby impairing spike protein-mediated virus entry into the cell or preventing spike protein alone from entering the cells.[152-153] Many other phytochemicals and bioflavonoids also demonstrate this ACE2 binding capacity.[154-155]
5. ***Other Bio-Oxidative Therapies***. These include ozone, ultraviolet blood irradiation, and hyperbaric oxygen therapy (in addition to hydrogen peroxide and vitamin C). All these therapies are highly effective in patients with acute COVID

infections. For PSP syndrome or chronic COVID syndrome, the clinical responses are still good, but less clear-cut and definitive than with acute COVID. That is not to say, however, that all three would not prove to be just as excellent for dealing with the spike protein as with the intact virus. Many combinations and protocol adjustments remain to be tried and reported.

Ultraviolet blood irradiation is a treatment with over 100 years of history that has consistently demonstrated a profoundly positive impact on acute infectious diseases. Similarly, it has proven to be as dramatic a treatment for PSP and chronic COVID. It has recently been incorporated and modified into a new treatment protocol that is proving to ***cure*** PSP, or at least indefinitely resolve the clinical and laboratory evidence of this chronic infection, as no significant recurrence or relapse has been seen after this treatment. See below for further details.

6. ***Baseline Supplementation***. Thousands of quality vitamin, mineral, and nutrient supplements are all capable of making a positive health contribution. A baseline regimen of supplementation that considers expense, overall health impact, and convenience should include the Super 8 supplements, administered at the appropriate dosage. These supplements contain the calcium regulators that individually decrease all-cause mortality while lowering intracellular calcium levels (see Chapters 13 and 21):

   ✓ Vitamin C

   ✓ Magnesium

- ✓ Vitamin D3
- ✓ Vitamin K2

And the four supplements that directly promote ATP production in the mitochondria (see Chapter 18):

- ✓ Niacinamide (or niacin, Vitamin B3)
- ✓ Vitamin B2 (riboflavin)
- ✓ Coenzyme Q10
- ✓ Methylene blue

For specific supplement protocol information, see Appendix A. In addition to the baseline supplementation provided by the Super 8, there are others to consider, including chelating agents that should be prescribed by a physician based on the specific heavy metals that may be accumulated in the patient. The physician may also want to add nattokinase or another proteolytic enzyme, along with a regimen of ivermectin, which may be particularly beneficial for patients with PSP.

The suggested optimal way to deal with acute COVID that has evolved into long-haul COVID, or with symptoms consistent with the toxic effects of circulating spike protein post-vaccination, is to always eliminate any active or chronic areas of pathogen proliferation with HP nebulization. Vitamin C supplementation should be optimized simultaneously. 50-gram infusions of sodium ascorbate should be administered at least several times weekly as long as there is symptomatology attributable to long-haul COVID and circulating spike protein. Equivalent total dosing, but given intermittently throughout the day, should prove to be even more effective as circulating vitamin C is rapidly excreted. Oral vitamin C supplementation should also be taken, either as several grams of liposome-encapsulated vitamin C daily, or as a teaspoon of ascorbic

acid powder several times daily (sodium ascorbate if ascorbic acid causes stomach upset). A hydroxytyrosol (olive leaf extract), metadichol®, and/or policosanol supplement can be added to this as well. The vitamin C administrations can even be "supercharged" with the proper addition of hydrocortisone to optimally usher the vitamin C into the cells (see Chapter 11).

With the "foundation" of HP nebulization and proper vitamin C supplementation in place, the best prescription medicines to counter long-haul COVID and circulating spike protein would be with ivermectin first, and then hydroxychloroquine or chloroquine if the clinical response is not acceptable. Dosages would need to be determined by the healthcare provider in charge.

## A Simple Chronic COVID Cure?

Fabrice Leu, ND, a Swiss naturopath with an advanced federal diploma, applied some modifications to UV blood irradiation in chronic COVID patients and quickly saw what can only be described as astounding results. He found that using only a ***single*** specific UV light frequency, along with a special technique that hyper-oxygenated the 50 cc blood sample. At the same time, the blood sample was ***repeatedly*** exposed to this UV frequency, which quickly resolved ***even the most advanced*** cases of chronic COVID in patients.

Many UV devices irradiate with a ***spectrum*** of frequencies, much like a multivitamin supplies a wide range of vitamins. However, when the optimal UV frequency is just one of many, only a relatively small amount of its impact will be felt upon using such a spectrum device, just as with the minimal amount of any one vitamin received in a multivitamin. However, when that one frequency is the most effective, it is crucial to maximize exposure to

it, rather than minimizing it and spreading it out among less effective frequencies.

Furthermore, the blood sample in most UV blood irradiation protocols receives only a one-pass irradiation. In this protocol, the blood specimen is passed ***back and forth many times*** ("ping-ponging") across the UV light irradiation machine. Certainly, what is happening physiologically in the patient is not clear.

Hopefully, this will eventually be understood as more research is done with this protocol and technique. However, the clinical results are very dramatic, clear-cut, and consistent, and all chronic COVID patients should be given the benefit of this protocol unless earlier measures have already resolved their syndrome. To see videos of the technique: https://rumble.com/v5e4thn-introduction-to-hot.html and https://rumble.com/v3j379q-dubai-practitionner.html.

To further establish the objectively positive impact of this UV blood irradiation technique, Leu also measured D-dimer levels in many of these individuals. Even astronomical elevations of D-dimer (a blood test often associated with increased blood clotting secondary to PSP) promptly dropped and usually completely normalized after one to three treatments over several weeks. Over more than two years, the roughly 45 patients who had recovered entirely clinically (approximately 90% of all treated) did not return due to the recurrence of symptoms. The preliminary results on this approach to chronic COVID have been detailed in an article.[156] This article also includes links to descriptive videos on the technique.

It is also important to note that the UV light wavelength being applied has been shown in the literature to be particularly effective against COVID-19, specifically SARS-CoV-2. Although a range of frequencies (200 to 280 nm) can inactivate viruses, the frequency

used in the machine by Leu is 254 nm ***only***.[157-160] Additionally, it has been demonstrated that even slight differences in UV wavelength can have a significant impact on anti-pathogen and anti-disease effects. 254 nm UV light irradiation was shown to be significantly more effective at inactivating SARS-CoV-2 than 222 nm UV light irradiation.[161-162]

Finally, when one considers how difficult chronic COVID has been to effectively treat and even resolve, using this same UV blood irradiation protocol should become a part of treatment protocols for a wide variety of other conditions. Ozone protocols, for example, can alleviate and/or cure many difficult medical conditions, yet it does not consistently resolve chronic COVID syndromes with PSP and elevated D-dimer levels. This would certainly suggest that any treatment that DOES consistently resolve chronic COVID while normalizing elevated D-dimer levels should be routinely included in the treatment of many other conditions that remain difficult to treat effectively. ***This could have profound implications for all infectious diseases and many chronic diseases (which are often fed by occult infections).***

## Recap

As the pandemic continues, there is an increasing number of chronic COVID patients and patients post-COVID vaccination with a variety of different symptoms. Furthermore, there is a growing number of vaccinated individuals who still end up contracting a COVID-19 infection. This is resulting in a tremendous amount of morbidity and mortality around the world. The presence and persistence of the COVID spike protein, along with the chronic colonization of the COVID virus itself in the aerodigestive tract and in the lower gut, appear to be significant reasons for illness in this

group of patients. HP nebulizations should always be part of the treatment of such patients.

Treatment is aimed at neutralizing the direct toxic impact of the spike protein, while also blocking its ability to bind to the receptors necessary to hijack the cell's metabolism and replicate the COVID pathogen and/or the spike protein itself. At the same time, treatment measures are taken to ensure the most complete elimination of PSP as possible in the patient.

Persistent elevation of D-dimer protein in the blood appears to be a reliable marker of persistent spike protein, especially circulating spike protein. Additionally, the presence of Rouleaux formation in RBCs, consistent with PSP, including chronic COVID-19 and post-COVID shots (especially boosters), appears to be a reliable indicator of ongoing spike protein presence. Evidence now indicates that infusions of vitamin C and ozonated saline, or a series of ozonated blood infusions alone, can rapidly result in the complete resolution of the advanced Rouleaux formation visible earlier under dark-field microscopy. Although new research is ongoing daily that may modify therapeutic recommendations, it appears that applying bio-oxidative therapies is a practical and efficient way to mitigate the continuing morbidity and mortality associated with the persistent presence of spike protein in chronic COVID and post-COVID vaccination patients.

Multiple agents can play a role in eradicating PSP, and no single protocol will be ideal for all patients for several reasons. However, bio-oxidative therapies should ***always*** be a significant part of any treatment protocol, unless complete clinical resolution has already been achieved with an earlier treatment. A special UV blood irradiation protocol has been shown to be enormously effective in achieving a clinical cure of chronic COVID patients,

along with dramatic normalizations of previously elevated D-dimer levels. This protocol should become part of the treatment protocol for all chronic COVID patients, as well as for many other conditions. Indeed, if available, it should also promptly cure all acute cases of COVID.

## Chapter 5

*A man dies when he refuses to take a stand for that which is true.*

Martin Luther King, Jr.

# How Toxins Cause Heart Failure

## General Heart Assessment

Cardiomyopathy, which simply means heart muscle disease, can occur as a primary affliction of the heart muscle, as a secondary condition negatively impacting heart function, or as a combination of both.[1-3] Heart failure is a clinical diagnosis that describes the severity of limitations in cardiac output, or the amount of blood the heart is capable of pumping. For the practicing clinician, the most critical considerations in approaching the cardiomyopathy patient with clinical heart failure are:

- ✓ Is the heart muscle itself diseased?
- ✓ Is the heart muscle normal, but being forced into failure by non-cardiac factors?
- ✓ Is the clinical presentation a combination of both these conditions?
- ✓ Is the treatment protocol aimed only at relieving symptoms or also at resolving the underlying pathology resulting in clinical heart failure?

Because cardiomyopathy presenting in clinical heart failure is a condition often involving multiple factors, there is no single treatment protocol that can be considered optimal. Furthermore, heart failure rarely occurs in isolation without other diseases and co-morbid conditions being present and contributing to its symptoms as well.[4-5] However, all presentations of heart failure share features that must be addressed, regardless of whatever other treatments are being administered. The enormous public health impact of heart failure cannot be overstated. In Germany, for example, heart failure is the most common primary inpatient diagnosis.[6]

## Heart Failure Pathophysiology

When the function of the heart is impaired sufficiently to decrease the amount of blood that should be pumped with every heartbeat (cardiac output), a clinical picture of heart failure will eventually emerge. As the body can clinically compensate reasonably well for early heart failure, it is only when the decreased function is severe enough and chronic enough that heart failure symptoms become clear-cut. Because of this, even seemingly mild heart failure symptoms should be taken very seriously, with a complete diagnosis (especially in the ongoing pandemic setting), and the application of scientifically based treatments to support and improve heart function.

Common symptoms of heart failure include the following, due basically to the abnormal accumulation of fluid in the lungs and the rest of the body from inadequate heart pumping ability:[7-8]

- ✓ Shortness of breath at rest or too quickly with exertion
- ✓ Shortness of breath when lying flat
- ✓ Waking up suddenly short of breath
- ✓ Fatigue

- ✓ Swelling in feet, ankles, and eventually legs and/or abdomen
- ✓ Accelerated heart rate, palpitations
- ✓ Heart muscle cells do not just fail and "wear out" for no reason. When oxidative stress increases within heart cells (myocytes), inflammation, by definition, also exists there. Additionally, part of the increased oxidative stress is attributed to a decrease in ATP (adenosine triphosphate) production in the mitochondria of heart cells. As ATP is the primary energy-providing molecule in the body, heart cells with compromised ATP production experience increased oxidative stress, resulting in a clinical picture of inflammation, or myocarditis.

When the factors increasing oxidative stress are intense and acute in onset, rapid heart enlargement with poor heart contraction (congestive cardiomyopathy) will result. However, when the factors increasing oxidative stress are less intense and more chronic, the heart will generally first "adapt" by increasing the heart wall thickness without enlargement of the left ventricular dimensions (hypertrophic cardiomyopathy). A clinical picture of heart failure will still be present and continue to evolve as the heart wall thickens, making the left ventricle stiffer and less compliant. This results in the heart chamber not filling up as readily (diastolic heart failure, or heart failure with preserved ejection fraction)[9-10] Effectively, this form of cardiomyopathy consumes *more* ATP trying to fill the heart than it does to pump and empty it.[11]

With this resistance to heart chamber filling, the amount of blood pumped with each heartbeat eventually decreases, and the blood supply coming into that chamber "backs up," resulting in the heart failure symptoms noted above. To be discussed below, *toxins cause both forms of cardiomyopathy*. Left untreated, the terminal stages of hypertrophic cardiomyopathy evolve into a congestive cardiomyopathy, with substantial enlargement of the

left ventricle and very poor contractility. This will result even when the heart was not enlarged or poorly contracting at the onset of the myocardial inflammation. The initial clinical presentation of heart failure is roughly split equally between hypertrophic and congestive cardiomyopathy.[12]

Loss of functioning heart muscle is commonly considered to be the cause of congestive cardiomyopathy most of the time. This is undoubtedly a major reason for heart failure when multiple heart attacks with death of heart muscle and fibrotic scarring are present in place of contracting heart muscle. However, heart biopsies in consecutive patients with advanced coronary artery blockages and clinical heart failure indicated otherwise. The microscopic evaluation of these biopsies indicated that myocarditis (heart muscle inflammation) was the underlying cause, and heart function in some of these patients improved *dramatically* with anti-inflammatory measures. In the absence of active ischemia or old heart attacks with extensive loss of heart tissue, it is erroneous to consider ischemia as a primary cause of congestive heart failure, except to the degree that it increases oxidative stress in the remaining heart muscle. The crucial takeaway point is that *myocarditis is not necessarily an obvious diagnosis*. There must be a lower threshold for taking heart tissue biopsies, as missing the diagnosis of a treatable condition greatly increases morbidity and mortality for many patients.[13]

**...t*oxins cause both forms of cardiomyopathy*. Left untreated, the terminal stages of hypertrophic cardiomyopathy evolve into a congestive cardiomyopathy, with substantial enlargement of the left ventricle and very poor contractility.**

## Toxins and the Heart

While toxin accumulation in the heart muscle can be the singular cause of advanced heart failure, it will much more often be one of several factors contributing to decreased heart contractility and function. Also, the chronicity of heart failure, regardless of cause, will play a significant role in determining its reversibility, as more inflamed heart cells will eventually die. As cells die, the loss of function is more permanent and not just related to how well chronically inflamed cells can subsequently recover. Such inflammation is consistently seen on the microscopic study of heart biopsies in toxin- and infection-related cardiomyopathy.[14-15] Various toxins, including many heavy metals, have been either linked to heart failure or clearly shown to be the *direct cause*. Heavy metals significantly increase oxidative stress and promote disease wherever they accumulate.[16-21] Furthermore, one or more of these heavy metals are *nearly always present* in high concentrations in the poorly contracting heart muscle. A partial list of such agents includes the following:

- ✓ Lead
- ✓ Copper
- ✓ Iron
- ✓ Mercury
- ✓ Aluminum
- ✓ Cobalt/Chromium
- ✓ Cadmium
- ✓ Gold/Silver
- ✓ Chemotherapy
- ✓ COVID Spike protein

### Lead:

In a 3-year-old girl with chronic lead poisoning, acute heart failure developed that was clinically reversed after four days of

calcium EDTA chelation therapy.[22] Children who died from heart failure secondary to acute lead poisoning were documented to have the microscopic findings of myocarditis.[23] Lead has been shown in other studies to target the heart and the vascular system.[24-27] Animal studies have also shown that enough lead exposure will reliably cause myocarditis and vascular damage, as is seen in humans. These studies demonstrate that lead exposure can promote atherosclerosis and high blood pressure as well.[28-30]

### Copper:

A transition metal necessary for normal cell function but easily pushed to excess and toxic levels in the body, copper is another culprit toxin commonly involved in cardiomyopathy patients.[31] Excess copper appears to be especially toxic to the heart, as the infusion of copper into the coronary circulation of rats results in impaired heart function in only minutes.[32] Hypertrophic cardiomyopathy has been strongly linked to the excess copper levels seen in Wilson's disease. Trientine, a selective copper chelator, has been shown to improve cardiac function in patients with hypertrophic cardiomyopathy.[33]

**...a clear diagnosis of copper excess does not need to be made before treating patients presumptively as having too much copper in their heart, especially when heart wall thickening is present in a diabetic patient.**

In a randomized, placebo-controlled trial of diabetic patients with left ventricular thickening (which can lead to hypertrophic cardiomyopathy), copper chelation significantly decreased heart wall thickening. This study *did not even screen for elevated copper levels*.[34-35] Furthermore, trientine chelation in diabetic rats with advanced left ventricular failure over an eight-week period demonstrated significantly improved heart function.[36] Another

study on heavy metal removal in diabetic rats, using either trientine or citrate (citric acid), significantly protected heart function.[37] In a case report, a patient with scleroderma and a congestive cardiomyopathy improved dramatically on penicillamine, an effective chelator of copper, lead, and mercury. No copper level testing was reported as part of the patient's evaluation.[38] These studies further indicate that toxicity from copper and/or other heavy metals in the heart is a common and significant contributing factor in patients with early heart wall thickening and then its later decompensation into decreased cardiac function and heart failure.

It appears that a clear diagnosis of copper excess does not need to be made before treating patients presumptively as having too much copper in their heart, especially when heart wall thickening is present in a diabetic patient.[39] It has also been shown that a copper-overload state is a primary factor in the pathogenesis of damage to any organ in the diabetic.[40] Copper removal has also been shown to decrease the inflammatory response to radiofrequency ablation treatment for liver cancer in rats.[41] These findings strongly suggest that:

> **The unsuspected presence of excess copper in tissues and organs can impair the resolution of any pathology being treated, suggesting a potential beneficial role for copper removal measures for various medical conditions.**

## Iron:

Congestive heart failure secondary to severe iron overload in the body has been reported. The daily administration of an iron chelator (deferoxamine) to a patient with congestive cardiomyopathy over approximately a year resulted in a significant improvement in heart function and cardiac output, with the heart's pumping ability more than doubling (ejection fraction increased from 20% to 48%).[42] Another case report described a 27-year-old

woman with "severe heart failure" who completely normalized on an iron removal regimen.[43] Patients with severe iron overload cardiomyopathy have an average survival of only one year when therapeutic phlebotomy (blood donation) and iron chelation are not utilized. This form of cardiomyopathy begins with restricted filling of the heart (diastolic dysfunction) and then progresses to congestive cardiomyopathy.[44]

**In animal studies, excess cellular iron in heart cells has been shown to increase oxidative stress and impair the mitochondrial electron transport chain's (ETC) ability to produce ATP.**

Iron overload cardiomyopathy occurs most commonly in patients with hereditary hemochromatosis or secondary hemochromatosis (as with β-thalassemia and sickle cell anemia).[45] However, excess iron short of that seen in full-blown hemochromatosis can still be expected to inflict its dose-dependent toxicity. Most adults already have excess levels of iron in their bodies, as indicated by elevated ferritin levels that are often erroneously considered normal in laboratory reference ranges. Excess iron in the heart is also a predisposing factor to developing atrial fibrillation, an arrhythmia that contributes to increased morbidity and mortality.[46]

In animal studies, excess cellular iron in heart cells has been shown to increase oxidative stress and impair the mitochondrial electron transport chain's (ETC) ability to produce ATP. As ATP is the primary energy-providing molecule in the body, any decrease in its production always results in compromised cellular function.[47-48] Notably, resveratrol supplementation has been shown to dramatically improve heart function in animal models of iron overload cardiomyopathy.[49-51] In another animal study, either deferiprone or N-acetylcysteine was effective in decreasing cardiac iron concentration.[52]

## Mercury:

As the most toxic non-radioactive element, mercury is a heavy metal that causes grave damage wherever it accumulates. A landmark study directly compared toxic heavy metal concentrations in biopsies of heart muscle in patients with idiopathic dilated cardiomyopathy (IDCM) against control muscle biopsies. IDCM is a condition of advanced heart failure with a very enlarged heart of unknown cause. The cardiomyopathic heart muscle contained *22,000* times more mercury than normal heart muscle. In comparison to normal specimens, the same diseased heart muscle contained *12,000 times* more antimony, 11 times more gold, 13 times more chromium, and 4 times more cobalt. Notably, the study group did not undergo primary screening to detect increased heavy metal exposure, suggesting that these accumulations *likely represent the findings in most cases of IDCM.*[53] Unless excess exposures to heavy metals are readily apparent, the widespread effects of such poisonings make it very unlikely that such a toxicity will be suspected and then correctly diagnosed.[54] Heavy metal exposure, with mercury exposure of most significant consequence, has been shown to increase the risk for severe congenital heart defects in the offspring.[55]

**The cardiomyopathic heart muscle contained *22,000 times* more mercury than normal heart muscle.**

In another study, the heart muscle of patients with cardiomyopathy examined at autopsy was found to have significantly higher levels of lead, nickel, copper, and manganese, as well as significantly lower levels of zinc, compared to the heart muscle of patients without cardiomyopathy. Mercury and antimony levels were not reported and were presumably not measured.[56] This study indicates that most patients with IDCM have not only astronomical levels of mercury and antimony but also significant elevations of lead,

nickel, and copper. *If it were not a vital organ, the heart's ability to selectively remove heavy metals from the blood and the rest of the body could be considered a protective mechanism for the body's health.*

This leads to the conclusion that:

> **Cardiac muscle in patients with advanced congestive cardiomyopathy is the preferred site for the accumulation of most heavy metals that enter the body.**

Currently, IDCM is the cause of heart failure in over 100,000 people in the United States, and it is the *underlying diagnosis leading to 45% of heart transplants*. Furthermore, evidence of resolved or ongoing viral infection in heart biopsy specimens is seen in 25% of IDCM patients.[57] Up to 80% of IDCM patients demonstrate one or more anti-heart autoantibodies. Such antibodies are commonly the result of occult infections. Heavy metal accumulations and chronic viral myocarditis appear to be pathology-precipitating partners.[58] While it is unclear whether one factor better facilitates the presence of the other, it appears that heavy metal accumulation, headed by mercury and probably antimony, is a *prevalent cause of IDCM*. Based on these studies that have specifically measured heavy metal status in IDCM heart muscle, heavy metal accumulation appears to be the culprit for this advanced form of heart failure most of the time. The IDCM heart seems to be a chemically attractive site for the accumulation of multiple heavy metals after being primed by an earlier myocarditis-precipitating viral infection, as no other organ in the bodies of IDCM patients appears to concentrate these toxins similarly.

**...it appears that heavy metal accumulation, headed by mercury and probably antimony, is a *prevalent cause of IDCM*.**

Mercury also works effectively to produce a deficiency state of selenium. Restoring deficient selenium stores can lessen clinical mercury toxicity, although it does not directly promote the mobilization or elimination of mercury. Congestive cardiomyopathy secondary to selenium deficiency has been reported, and restoring depleted selenium levels can reverse it.[59-62] Based on the data above on mercury and IDCM, a cardiomyopathy associated with selenium deficiency is likely a cardiomyopathy significantly worsened by the toxicity of excess mercury, no longer negated by a sufficient presence of selenium. Notably, excessive supplemental selenium can be toxic, unlike many other nutrient supplements, and should not be overused.

## Aluminum:

Aluminum phosphide, an agent used as a pesticide, induced a severe, but reversible, cardiomyopathy after accidental poisoning in an exterminator.[63] Intense supportive care to reverse low blood pressure was shown to facilitate the recovery of other individuals poisoned with aluminum phosphide, that resulted in severe compromise of heart contractility.[64-65] In a hemodialysis patient who expired with heart failure, heavy aluminum deposits were seen in the heart cells upon electron microscope examination.[66] An animal study also showed that aluminum chloride could induce a largely reversible cardiomyopathy.[67] Organic acids (succinic, malic, or citric) and the iron chelator, desferrioxamine, are agents that can mobilize (solubilize) and eliminate aluminum accumulations.[68]

## Cobalt/Chromium:

Cobalt is another toxic heavy metal documented as a cause of congestive cardiomyopathy. Elevated blood cobalt levels have been identified in some patients with metal hip implants.[69-70] Elevated blood chromium levels from the implants have also been

observed.[71-72] However, the presence of such elevations does not guarantee that a cardiomyopathy will result.[73] As noted above, IDCM often starts with an undiagnosed viral myocarditis. Such a myocarditis appears to inflict the myocardial damage that triggers the almost sponge-like uptake of cobalt and other heavy metals, as described in the section on mercury accumulation in the heart. An animal study also showed that a poor diet (protein restriction) further predisposed the heart to cobalt toxicity.[74] N-acetylcysteine is effective in significantly reducing the blood concentrations of both cobalt and chromium.[75] Alpha lipoic acid is another effective chelator of cobalt.[76]

## Cadmium:

A study examining blood, serum, and urine heavy metal levels found significantly higher cadmium levels in patients with IDCM compared to healthy controls.[77]

## Gold/Silver:

While gold and silver are not generally recognized as toxic substances, some care must always be exercised in a supplementation regimen, especially one involving metals. In a case report, a dilated congestive cardiomyopathy resulted from the excessive ingestion of colloidal gold for about three months, along with a history of intermittent colloidal silver ingestion over the prior seven years. In addition to an enlarged heart that was contracting poorly, a significant new heart conduction abnormality (left bundle branch block) resulted from this supplementation. Following chelation therapy (dimercaprol), the block disappeared, and the heart's ejection fraction improved from 20% to 50%, a very dramatic improvement. Notably, urine screening (with no tissue levels measured) revealed no evidence of excess aluminum, arsenic, barium, beryllium, cadmium, copper, manganese, or thallium.[78]

## Chemotherapy:

Cancer chemotherapy utilizes some agents that are highly toxic to the heart. Anthracyclines (doxorubicin, idarubicin, epirubicin, and mitoxantrone) often result in some degree of heart enlargement and decreased contractility.[79-80] These are cardiac effects that are largely considered irreversible, despite chelation therapy being effective in preventing such cardiac damage.[81-84] Considering that multiple toxins and heavy metals are typically present in patients with IDCM, it should not be assumed that trying to remove as much of the toxin load from the body (and the heart) will be of no benefit. Cancer patients typically have other diseases as well, and it is reasonable to think that some of these patients (such as those with the copper accumulation often seen in diabetes) might have already been accumulating cardiac toxins long before there was any evidence of cardiac compromise. As such, chelation therapy would have the potential to reverse the cardiac damage currently seen with chemotherapy at least partially.

## COVID Spike Protein:

Persistent spike protein (PSP) syndrome is seen when the COVID-19 pathogen-related spike protein stays in the body following a COVID vaccination and/or because it was never eliminated following an unresolved COVID infection (chronic or long-haul COVID).[85-87] While the spike protein has been detected throughout the body in autopsy studies of COVID-19 patients, it appears to have a particular predilection for targeting the heart and its blood vessels.[88-93]

The spike protein inflicts damage in the heart and elsewhere in the body by multiple mechanisms. These mechanisms include:

- ✓ Facilitating COVID pathogen entry into cells (ACE2 receptor binding)[94-96]

- ✓ Overstimulation of the immune response due to chronic activation by the continual presence of PSP potentially leads to the development of an autoimmune disease[97-99]
- ✓ Attacking not only tissue and organ cells directly, but also the walls of the blood vessels and the platelets circulating in them, resulting in the increased formation of blood clots[100-101]
- ✓ Intrinsic toxicity of both the complete spike protein and its fragments[102-104]
- ✓ The ability to enter the genome of the cell, where it cannot be readily eradicated, along with the seeming ability to be replicated indefinitely[105]

Myocarditis, sometimes involving heart enlargement and heart failure, can result from the spike protein exposure following COVID-19 vaccine(s) and/or from its persistence in chronic COVID. However, many cases of spike protein myocarditis, probably a substantial majority, are chronic, smoldering conditions that remain undiagnosed except when there is clear clinical evidence indicating their presence.

**A heart with a minimal elevation of troponin is the perfect setting for a catastrophic clinical response when an additional spike protein-laden injection is given, much like what gasoline would do to smoldering coals.**

Myocarditis, which means inflammation of some or all the muscle cells in the heart, can occur when the spike protein binds to the blood vessels in the heart, to the muscle cells themselves, or both.[106] Even when the myocardial blood vessels get more selectively targeted, inflammation of the heart muscle itself can still eventually ensue as the circulation of the heart becomes progressively impaired by blood clotting and/or by an increased resistance to blood flow resulting from inflammation-induced

vasoconstriction. Pre-pandemic myocarditis (cases not related to a spike protein presence) generally did not involve any predisposition to blood clotting in addition to the inflammation of the affected heart muscle cells.

Myocarditis offers no significant diagnostic challenge when it presents in its classical manner. Chest pain and rapid heart rate are often the earliest symptoms. If the myocardial inflammation is evolving rapidly, symptoms of congestive heart failure, including shortness of breath and swelling of the lower legs, can occur as well. Not uncommonly, an upper respiratory tract viral infection will be present, or there will be a history of such an infection having recently resolved clinically. Chest X-ray, electrocardiogram (ECG), and echocardiogram can all be used to help establish the diagnosis. An elevated troponin level on blood testing is extremely sensitive in detecting ongoing heart muscle cell damage, and some elevation of this test will always be seen if significant inflammation is present in a large enough number of heart muscle cells.

> **Any continued elevation of troponin in the blood, however minimal, must be regarded with significant concern, even if there appears to be a complete clinical resolution of the myocarditis. Everyone should have this test done, even if they are feeling perfectly well, to both establish a baseline within the normal range and to detect any unsuspected low-grade myocardial inflammation.**

The very high sensitivity of the troponin test has revealed that there are countless numbers of people post-COVID infection and/or post-vaccination who are continuing to have sustained subclinical degrees of myocardial inflammation. No matter how minimal the elevation of the test, any increase means that a gradual and continued loss of heart muscle function will occur over time. It also means that the heart is highly susceptible to an acute and potentially severe worsening of heart function when an additional

exposure to more spike protein occurs, as has been seen with the vigorously promoted booster shots.

> **A heart with a minimal elevation of troponin is the perfect setting for a catastrophic clinical response when an additional spike protein-laden injection is given, much like what gasoline would do to smoldering coals. Not surprisingly, it has been shown that COVID patients with higher troponin levels were more likely to die than those with lower levels.**[107]

Many abnormal troponin tests eventually resolve completely, and *many do not*. The quality of the diet and its proper digestion, the strength of the immune system, and the quality of the nutrient/vitamin/mineral supplementation being taken are all critical factors in determining whether a minimal, subclinical degree of inflammation in the heart is capable of completely resolving with a return of the troponin level into the reference, or normal, range. With much of the world consuming a poor diet and not supplementing, there is an ongoing presence of spike protein in a *large* number of people worldwide. Clinical myocarditis is an *advanced* state of heart inflammation, characterized by significantly higher levels of troponin being released into the bloodstream. Cardiac injury was detected in 20% to 40% of patients hospitalized with COVID.[108-109] Any troponin elevation in hospitalized COVID patients was associated with increased mortality.[110]

Troponin testing is currently the most important and widely accepted method for determining whether a suspected heart attack has occurred, as troponin is released into the circulation when heart muscle cells die.[111] Some degree of myocardial injury is felt to be present when any troponin level is detected beyond the 99th percentile upper reference limit, whether in the context of a suspected heart attack or the possible presence of any inflammation in the heart.[112-113] *Even an increase in baseline troponin levels that remains below the established upper limits of normal (or reference*

*range) is significantly associated with increased mortality after noncardiac surgery.*[114] Baseline troponin testing is a good idea for everyone, since normal ranges can vary from lab to lab, and because it appears myocardial injury can still be present when the troponin level rises significantly from a baseline point but remains short of the upper reference limit.[115]

**Compared to patients with no troponin elevation, a significant increase in 30-day mortality was seen in patients having minor troponin elevations following noncardiac surgery.**

The importance of the most minimal troponin elevations has been established in several studies examining the relationship between preoperative troponin levels and long-term mortality following noncardiac surgery. Compared to patients with no troponin elevation, a significant increase in 30-day mortality was seen in patients having minor troponin elevations following noncardiac surgery.[116-117] Another similar study found greater than a *doubling* of the mortality rate when the two patient groups were evaluated at three years following the noncardiac surgery.[118] Furthermore, these increases in mortality were observed in patients without persistent spike protein, which would lead to additional oxidative stress in the heart.

A Swiss study analyzed troponin levels in 777 hospital employees who received a booster injection after previously receiving two doses. On the third day after the booster, troponin levels above the upper limit of normal were observed in 2.8% of the subjects. By the next day, half of the elevated troponin levels had returned to the normal range.[119] While longer-term follow-up data were not available, this data presents some serious questions: What would the troponin levels have been at one day post-injection? Did the troponin levels, which were still elevated at day four post-in-

jection, ever completely return to normal? If so, how long did that take to occur? Rather than being concerned that some myocardial damage was caused by the vaccine, which is openly acknowledged in the study, it is dismissed as being of no importance since half of the elevated troponins resolved within 24 hours.

> **Any vaccine should not require or invoke any degree of damage to any tissue in the body, much less the heart, to stimulate an immune reaction to the antigenic material being injected. Additionally, as is often seen with many papers addressing related issues, the significance of any vaccine side effect is consistently downplayed, falsely concluding that the vaccine does much more good than harm without further qualification as to why such a conclusion is valid.**

Having even the most minimal elevation of troponin not only raises the concern of some collective long-term heart damage, or the ease of having a "re-flaring" of inflammation with new spike protein exposures, as from a booster shot, but it also raises the concern of ***electrical instability*** in some of the inflamed myocardial cells. There is always a possibility of electrical instability in any inflamed myocardial muscle cells, as it is their normal physiological nature to transmit electrical impulses from one cell to the next. Because of this, stressful events that release surges of adrenaline and catecholamines in the circulation, as is seen with peak physical exertion, can readily provoke such electrically unstable cells into precipitating and sustaining an abnormal heart rhythm.

However, regardless of any benefits a COVID vaccine ***might*** have on the overall morbidity and mortality of those receiving it, it completely ignores that ***many*** effective treatments have been shown to either prevent most cases of COVID or to readily cure them when applied properly after the infection has been contracted.[120-124]

**With the availability of effective treatments, *no* significant vaccine side effect, especially fatal ones, should ever be tolerated, unless the vaccine candidate is fully aware of all possible side effects and chooses not to be bothered with the simple measures proven to prevent and/or treat the infection for which the vaccine is being offered.**

To date, ***every*** vaccine that has ever existed has a significant side effect profile. This information, along with a full disclosure of effective non-pharmaceutical therapies for the condition the vaccine is intended to prevent, should ***always*** be provided to both physicians and their patients.

It is also important to recognize that most tissues and organs in the body lack reliable laboratory markers indicating the presence and extent of ongoing spike protein damage. Tracking heart damage with troponin levels makes this organ relatively unique in this regard. Since ACE2 receptors are present in most organs and tissues, any continued elevation of troponin can also be considered a reliable indicator that spike protein damage is continuing to occur in organs and tissues outside of the heart. Spike protein would be expected to bind ACE2 receptors wherever it finds them, and such binding would always be expected to cause cellular inflammation and damage. Blood testing for natriuretic peptides also reflects myocardial damage. Still, the primary focus should remain on troponin testing and taking any necessary steps to return the test to the normal range and maintain it there.[125-131]

PSP syndrome routinely involves the heart, even when not readily apparent clinically. The spike protein has such a strong affinity for the heart muscle that chronic COVID-19 or post-vaccination patients are unlikely to ever have spike protein or its pathological impact elsewhere in the body, while sparing the heart. In autopsies of patients who died of COVID-19, either COVID-related viral RNA or evidence of myocardial inflammation was seen more

than 80% of the time.[132] Another autopsy study on COVID-19 patients who expired revealed the presence of spike protein in the heart in over 60% of cases.[133]

**If the absence of these causes is not clearly established, prophylactic nutrient chelation should always be part of any therapeutic protocol, or the reversibility of clinical heart failure will *never* be realized.**

Clinically significant myocarditis developed from PSP can often be missed and completely unsuspected clinically due to the patchy and limited nature of many cases of spike protein myocarditis.[134] The amount of heart tissue can often be so limited that troponin levels remain unaffected, and even in the low normal range. In a case report, conduction system cells in the atrioventricular (AV) node (heart cells that modulate the transmission of the electrical signal to contracting heart cells) were selectively inflamed, providing a reason why even a minimal, undetected spike protein myocarditis can trigger lethal arrhythmias.[135-136] In another case report, the spike protein was most dominant in the heart, specifically in the AV node and the pacemaker cells of the atrium. Scattered throughout the heart were single necrotic (dead) heart cells, adjacent to viable cells, further underscoring the exceptionally focal nature of spike protein attack in some patients.[137] Another autopsy study also reported this single-cell death in COVID hearts.[138-139]

Unlike the other toxic cardiomyopathies, spike protein involvement in the heart is typically not generalized, but rather demonstrates scattered and minimal involvement of the heart muscle.[140] Nevertheless, sudden cardiac death (not from a heart attack due to "traditional" coronary atherosclerosis) is no longer uncommon, and persistent spike protein presence is impacting a large number of individuals around the world who are cardiac symptom-free

but still liable to life-threatening arrhythmias under conditions of stress, including previously otherwise healthy young athletes.[141]

As the number of people with undetected spike protein/COVID myocarditis is enormous already and steadily increasing, part of the therapy for anyone felt to have persistent spike protein should still involve the regular administration of one or more heavy metal chelation agents. As discussed above, heavy metals appear to "await" the microenvironment of myocardial inflammation of a previous viral infection to begin accumulating, if they have not already accumulated there before the COVID infection or the vaccine administration. As with all other toxins, the combination of heavy metals and PSP will always substantially worsen any inflammation and electrical instability than from either one alone. Furthermore, this worsening is synergistic, and not just an additive negative impact of spike protein and heavy metals.

> **Before the diagnosis of idiopathic (unknown origin) cardiomyopathy is made, toxic and infectious causes must be ruled out. If the absence of these causes is not clearly established, prophylactic nutrient chelation should always be part of any therapeutic protocol, or the reversibility of clinical heart failure will *never* be realized. Currently, such diagnostic and therapeutic efforts are rarely made.**[142]

## Spike Protein, Heart Block, and Pilots

As would be logically expected, any agent that can cause inflammation in the heart would also be expected sometimes to involve the cells in the heart that generate and conduct the electrical sparks that initiate all contractions of the heart. As spike protein myocarditis can be patchy and not uniformly affect all heart muscle cells, heart rhythm problems are not always part of the clinical presentation of myocarditis. Nevertheless, when the

patchy involvement of heart cells involves some cells actively engaged in generating and conducting the electrical impulses that result in ventricular contraction, the presence of spike protein in only a few heart cells can still generate potentially fatal arrhythmias. Various degrees of heart block due to spike protein have been reported because of PSP.[143-148]

A condition known as multisystem inflammatory syndrome in children (MIS-C) has emerged since the onset of the COVID pandemic, appearing primarily in advanced COVID infections.[149-150] MIS-C and MIS in adults indicate that the COVID infection has resulted in widespread inflammation throughout the body, mostly developing from PSP, and often involving the heart and lungs. Minimal to advanced heartbeat conduction problems have occurred secondary to MIS-C, ranging from a prolonged PR interval (see below) on the electrocardiogram (ECG) to advanced and potentially life-threatening degrees of AV block.[151-152] When heart function is normal, the AV node allows a rapid conduction of the electrical pulse received from the atrium throughout the heart in a near-simultaneous manner so that heart muscle contraction is synchronized and optimally efficient. AV block results in an abnormal slowing of the heart rate and sometimes fatal secondary arrhythmias, including complete stoppage of the heartbeat (asystole). The spike protein can damage the heart at any age, although certain patient groups are more susceptible to this than others.

The PR interval is the time between atrial depolarization (contraction) and ventricular depolarization (contraction) as they pass through the atrioventricular node (AV node). Disease of the AV node, which affects its ability to optimally regulate impulse conduction leading to ventricular contraction, is reflected in the prolongation of this interval on the ECG. The normal PR interval ranges from 0.12 to 0.2 second. In younger individuals, especially well-trained athletes, a PR interval greater than 0.2 is usually

completely normal. However, when PR interval measurements have always been 0.2 or less and *then* start to lengthen as an older adult, there should be significant concern that the aging conduction system might manifest more significant conduction abnormalities in the future.

In the context of the pandemic, it is particularly concerning when PR interval prolongation is observed for the first time *following* a bout of COVID-19 and/or vaccination. This is a *clear indicator* of new inflammation in at least some of the heart conduction cells, however minimal it may be. Regardless, it should *never* be disregarded as inconsequential. All diseases have a spectrum of pathology, and the earliest stages of pathology should never be trivialized, especially when PSP might be present in the heart.[153]

> **In a Harvard study that extended over a 30- to 40-year period, it was found that individuals with PR intervals greater than 0.2 second had twice the risk of atrial fibrillation, three times the risk of needing a pacemaker (meaning the presence of advanced degrees of heart block), and nearly a** *one=and=a=half times* **increase in all-cause mortality. Furthermore, greater degrees of PR interval prolongation were associated with an even greater risk of these outcomes.**[154]

However, ignoring the inherent pathology in "suddenly" prolonged PR intervals in the middle of a pandemic is precisely what the Federal Aviation Administration (FAA) appears to have done. Facing a shortage of pilots due to both the vaccine requirement it initiated during the pandemic for pilots to fly, along with many early retirements that resulted, the FAA decided to change the rules, disregarding long-standing parameters of normalcy based on medical science, rather than satisfying corporate or political convenience.

The FAA has now *declared* a PR interval of 0.3 second to be the upper limit of a "new normal" in the FAA Guide for Aviation Medical Examiners as of October 2022. The October 2021 standards stated that the PR interval was normal when it was 0.2 second or less. However, this was changed the following year without explanation. The only logical explanation is that many pilots had developed prolonged PR intervals on their ECGs, lasting longer than 0.2 second. But with the new "declaration" of normalcy, pilots who had no symptoms were able to obtain clearance to fly with a PR interval of 0.3 second or less. And when that interval was even *greater* than 0.3 second, a "current Holter and cardiac evaluation" was finally required to receive clearance to fly. Considering that the normal PR interval ranges between 0.12 and 0.20 second, an interval of 0.3 second represents a "permissible" increase in this interval by *over 100%* relative to the low normal interval of 0.12 second. This is not a nominal increase in the PR interval, but a substantial one.

> **When such PR interval prolongations are present and the Holter monitor test reveals a significant number of ectopic beats, vigorous magnesium supplementation must be administered until the Holter test returns to a normal or very near-normal status, before a pilot is again permitted to fly** (see Chapter 13)**.**

Even now, a treadmill exercise stress test is not required for commercial pilots to receive medical clearance to fly! This is not a safe policy by the FAA and arguably a *shocking* one, as many pilots are in the age range when heart attacks occur without any early symptoms, and still with a normal ECG, the ECG being the *only* mandatory heart-related test. Roughly a third of all deaths around the world are due to cardiovascular disease. And in Western countries, sudden

cardiac death occurs in about half of all coronary artery disease patients.[155-156]

More rigorous cardiac evaluations should be performed in prospective pilots and repeated at appropriate intervals. A normal ECG means a heart attack has not yet occurred, nothing more. A fatal heart attack from very advanced coronary artery disease could happen 10 minutes after a normal ECG was recorded. In addition to an ECG, all pilots should routinely have troponin and D-dimer levels measured. No pilot should ever fly when there is a persistent elevation of troponin levels and/or D-dimer levels, regardless of whether there are no apparent related symptoms. It is irrelevant that the pilot may feel well, have a normal ECG, and show no clinical evidence of myocarditis after having had COVID-19 or received a COVID-19 vaccination, without further testing, especially if the PR interval is greater than 0.2 second.

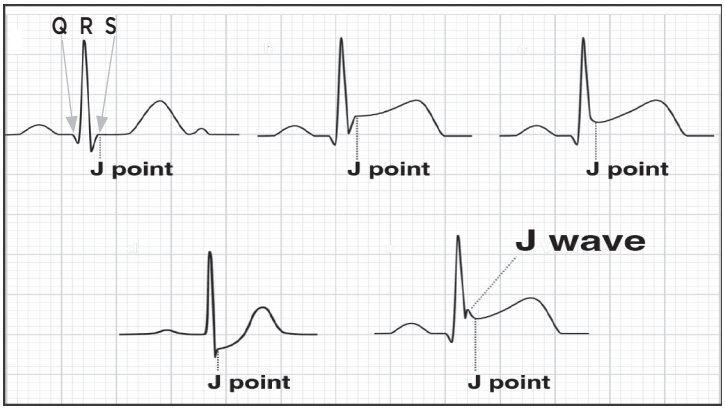
As mentioned in Chapter 13, over 2,000 seemingly healthy young individuals, mostly European soccer players, have collapsed on the field of play from 2021 through 2023. About 1,400 of them died. This did not occur at all before the pandemic and the widespread COVID-19 vaccinations. These facts indicate how healthy a spike protein-compromised heart can appear before suddenly proceeding to a fatal arrhythmia.

Similarly, any pilot who has had COVID and/or had one or more COVID vaccinations, and who has not been adequately evaluated for unsuspected signs of PSP, can potentially experience a life-threatening arrhythmia when a significant stress-provoking emergency arises in the cockpit. And if there are some underlying inflamed heart cells, for both pilots and athletes, these factors can increase the risk of a catastrophic arrhythmia:

- ✓ ECG finding of early repolarization
- ✓ Consumption of caffeine, alcohol, or stimulant drinks

- ✓ Consumption of water in plastic bottles (increased antimony exposure)
- ✓ Increased systemic inflammation and circulating toxins
- ✓ Surges of adrenaline during high-exercise or high-stress moments
- ✓ Moments of decreased oxygen tension (hypoxia) at peak exercise or chronically lower oxygen levels at altitude in the plane
- ✓ An abnormal lengthening of the PR interval on the ECG during the pandemic, after having been normal for the entire life up to that point
- ✓ Genetic or acquired structural abnormalities in the physical structure of the heart predisposed to starting and sustaining arrhythmias (reentry pathways)
- ✓ Underlying congestive or hypertrophic cardiomyopathy, with heart wall thickening and/or heart chamber dilation, usually with significant heavy metal accumulation in the heart cells
- ✓ Chronically low mitochondrial magnesium levels in the heart cells (further aggravated by sweating and diuretics). This is the primary factor that must be present to initiate extra beats and sustained arrhythmias in the first place.

The presence of early repolarization on an ECG is an interesting risk factor for cardiac arrhythmia, as it is considered a normal finding in younger individuals up to the age of 40 to 50. Yet, it can still be a factor that helps trigger an arrhythmia when inflamed conduction cells are present in the heart, as seen in PSP. The J wave (see diagram on next page) on the ECG represents a slightly skewed and prolonged QRS complex. This skewing of the depolarization phase of the ECG is a point in time when the heart is more readily provoked into generating an extra (ectopic) beat than during the




**The Q wave is the small dip down (negative wave) just prior to the large upward (positive wave), called the R wave, and the small negative wave after the R wave is called the S wave. The three waves as seen on an ECG are called the QRS complex. A J wave is an aberrant prolongation of the QRS complex and might indicate a heart that is prone to ectopic beats.**

classically normal and tightly synchronous QRS complex seen in older individuals without heart disease.[157]

It has been established that PSP myocarditis following vaccination is *most common in young men*.[158] Furthermore, sudden cardiac death secondary to PSP myocarditis has appeared to target the young (<40) substantially more often than even older individuals with one or more chronic diseases. While counterintuitive, there is a good explanation.

Statistically, the presence of early repolarization with J waves is seen in 1% to 13% of the general population, although it is significantly more common in athletes.[159] Most young individuals with this condition eventually lose it as they age. It is described as an imbalance between the epicardial and endocardial heart muscle layers, characterized by increased dispersion, or spreading out, of depolarization and repolarization.[160] By itself, however, when there is no inflammation (PSP) working to destabilize cardiac conduction cells, early repolarization has been well-established to be a benign

ECG normal variant with no correlation to an increased incidence of hospitalization.[161-162] This means that early repolarization alone is of no concern, but it can combine with other risk factors to increase the chances of significant arrhythmia.[163] In other words, early repolarization represents an electrical sequence in the conductive pathways of the heart that only becomes unstable when other pro-arrhythmic factors (such as decreased intracellular magnesium levels) are present as well.

Nevertheless, in patients with "sudden death" arrhythmias like ventricular fibrillation, early repolarization with J waves was seen six times more commonly than in control subjects (31% vs. 5%). In eight individuals, the origin of the extra beats provoking the arrhythmia was electrophysiologically mapped to sites associated with the origin of the J waves.[164]

## Spike Protein and Blood Clotting

A D-dimer blood test is a measure of the degree to which blood clots that have already formed are breaking up (lysis) and releasing those breakdown products into the blood. It is not a direct measure of how prone the blood is to clotting in the first place (increased coagulability). However, it is a very sensitive test that will always be elevated when increased blood clotting is occurring, since those clots must still be broken down to prevent circulation from shutting down. An elevated D-dimer test *should always raise concern*, as it indicates that increased blood clotting is almost certainly occurring. Only rarely is significant thrombosis seen in the absence of an elevated D-dimer level.[165]

In the context of the pandemic, individuals with a history of acute or chronic COVID-19 infection, as well as those who have received one or more vaccinations, *should always* be concerned if their D-dimer test results are elevated. It is clear evidence that there is an ongoing presence of spike protein binding to ACE2 receptors

in the inner lining (endothelium) of blood vessels in the body and/or to circulating platelets themselves, which initiates the formation of blood clots. Both contribute directly to blood clotting.[166] Blood clots can range from microscopic to massive. Such clotting is not typically part of a non-pandemic myocarditis free of spike protein. Certainly, having both elevated troponin levels and elevated D-dimer levels is especially worrisome and warrants prompt and aggressive treatment to resolve the underlying pathology.

**An elevated D-dimer test *should always raise concern*, as it indicates that increased blood clotting is almost certainly occurring.**

Both the COVID-19 vaccine and the COVID-19 infection have been documented to cause increased blood clotting and thrombosis.[167] Viral infections, in general, have also been found to promote abnormal blood clotting.[168] In critically ill hospitalized COVID patients, elevated D-dimer levels were found in about 60% of the time.[169] Not surprisingly, the longer that D-dimer levels remain elevated in COVID patients, the greater the morbidity and mortality.[170-172] Similarly, the higher the D-dimer level on hospital admission for COVID, the greater the chances of in-hospital mortality.[173]

When the underlying infection or other pathology is resolved, D-dimer levels can be expected to decrease as well. If a thrombotic event occurs, resolves, and there is no ongoing underlying pathology, D-dimer elevations will generally persist for only a few days before returning to normal. However, chronic COVID infections often demonstrate persistent blood clotting problems. In one study, 25% of a recuperating group of COVID-19 patients, who were already four months past the acute clinical phase of their infections, still demonstrated increased D-dimer levels. Additionally, the other standard laboratory parameters of blood clotting had already returned to normal in over 90% of these patients, indicating the

increased sensitivity of D-dimer testing in detecting blood clotting pathology. These additional tests included prothrombin time, partial thromboplastin time, fibrinogen levels, and platelet count. Even C-reactive protein and interleukin-6, tests that track inflammation, had typically also returned to normal.[174]

Platelet levels generally drop in the blood at the same time D-dimer levels are increasing, as they are consumed in the formation of the blood clots.[175] A post-COVID vaccination syndrome, known as vaccine-induced prothrombotic immune thrombocytopenia (VIPIT), with these laboratory findings, has been described.[176-179]

While the pandemic has given more attention to D-dimer testing than it ever had before, a D-dimer elevation can also be seen in a limited number of other conditions.[180] However, anyone today who is not chronically ill but still found to have an elevation of their D-dimer levels is likely suffering from the consequences of PSP presence in their vasculature, whether due to lingering COVID infection or due to having received one or more COVID vaccinations. Even if an individual has never had COVID or received a vaccination, an extensive medical evaluation is always warranted, as a D-dimer elevation is never normal. A persistently elevated D-dimer level should never be dismissed as inconsequential just because the patient feels well. Notably, a PSP presence can be detected in many tissues despite being cleared from the blood, resulting in a chronic COVID-19 picture in that patient, despite a normal D-dimer level. Chronic COVID-19 with spike protein in the blood, resulting in an elevated D-dimer, always has a worse long-term prognosis than when it is absent from the blood with a normal D-dimer level. Aside from inducing fatal arrhythmias, PSP will generally only kill because of thrombotic complications.

## ATP Physiology and Cardiomyopathy

No cell, whether in the heart or elsewhere, is healthy when mitochondrial function and ATP production are chronically suppressed. Such suppression will reliably occur when the reduction-oxidation balance inside the cells is sufficiently shifted toward excess oxidation. All diseased cells have an insufficient presence of antioxidants, which is reflected in higher cellular levels of calcium and lower cellular levels of magnesium, vitamin C, and glutathione. When these levels remain low, mitochondrial ATP production will also be depressed. *These cellular abnormalities are consistently present* in diseased tissues or organs.[181-182]

When cardiac ATP production can be restored to optimal levels, accompanied by a normal ability to increase with exercise, a healthy heart will result, unless irreversible damage has already occurred. Of note, mitochondria are especially abundant in heart tissue, and these mitochondria generate more than 90% of the heart's energy. As the heart seeks to renew its ATP content every 20 seconds or so, it can demonstrate clear mitochondrial insufficiency (heart failure) when other organs appear to be less affected or completely unaffected.[183-184] No organ consumes more energy per gram of tissue than the heart.[185]

As the mitochondria are the intracellular sites of ATP (energy) production, significant research has been directed at finding ways to reverse or lessen "mitochondrial dysfunction."[186] In most cases, mitochondrial dysfunction evolves from the increased oxidative stress resulting from chronic infection and toxin accumulation. However, rare genetic defects in mitochondrial function can also result in a similar clinical picture, characterized by decreased energy production.[187]

Much of this mitochondrial research has focused on defects in the electron transport chain (ETC), which is embedded in the membranes of the mitochondria. The ETC directly fuels the ATP synthase enzyme, which is vital to the production of ATP at the

end of the chain. The ETC has four main complexes, or steps, that work to optimally shuttle electrons to the terminal ATP-producing enzyme.[188-189] These complexes and their significant characteristics can be summarized and greatly *simplified* as follows:

- ✓ Complex I: NAD (nicotinamide adenine dinucleotide) in its reduced form, NADH, starts the electron donation sequence.
- ✓ Complex II: FAD (flavin adenine dinucleotide) in its reduced form, FADH2, continues the electron relay to ubiquinone (oxidized coenzyme Q10 [CoQ10]).
- ✓ Complex III: Ubiquinol (reduced CoQ10) relays the electrons to cytochrome c.
- ✓ Complex IV: Cytochrome c oxidase then receives the electrons, where molecular oxygen is bound and reduced to water.
- ✓ ATP synthase (sometimes known as complex V) is then activated to complete the ETC electron shuttling with the subsequent production of ATP.

Mitochondrial dysfunction is most successfully addressed when the substrates of the ETC (NAD, FAD, CoQ10) are either directly supplemented or the precursors needed for their synthesis are supplemented. Fueling the ETC not only produces more ATP, but it also results in ***less oxidative stress*** being generated by the ETC agents as mitochondrial function becomes more efficient and total cellular oxidation declines.[190-191] When ATP can be increased and oxidative stress can be decreased, mitochondrial ***healing*** can occur. Such healing is suggested in a study that found cardiovascular mortality to ***remain reduced*** for eight years following the completion of four years of supplementation with CoQ10 and selenium.[192]

Defects in the ETC have been specifically identified in heart failure and are always present.[193] In even the most advanced cases of heart failure, there are still inflamed but viable heart cells that can be positively impacted with improved ATP production. Aside

from the chelation therapies noted above, bolstering mitochondrial function has been a primary physiological goal in the treatment of heart failure.[194] While heart disease can occur from inherited mitochondrial disorders, most cases of heart failure are due to diseased mitochondria because of the pathogens and accumulated toxins in the heart.[195]

Traditional medicine has no drugs that directly work to normalize mitochondrial dysfunction in heart failure patients. Instead, all the current prescription drugs work only to mobilize excess fluid accumulations and/or to lessen the workload (peripheral resistance) faced by the failing heart muscle. This is not to say that there is no place for these drugs, only that they should not be the only agents given to the patient. As with most prescription drugs, the therapeutic goal appears limited to symptom improvement while letting the underlying pathology continue to evolve. Traditional medicine is much better at diagnosing and naming medical conditions than at reversing or resolving them.

> **When targeted therapies capable of entering the ETC of the mitochondria and improving ATP production are utilized, the clinical response in heart failure is often dramatic.** *These include many of the patients considered to have terminal congestive cardiomyopathies with no possibility of improvement or significant long-term survival without heart transplantation***.**

CoQ10 is the most researched of these ETC-targeted therapies for cardiomyopathy, and its enormous benefits on cardiac function have been well-documented. The especially vital role of CoQ10 in supporting ATP production in the heart is reflected in its concentrations in different tissues in the body. Far more CoQ10 is found in the heart than is found in any of the 12 other human tissues examined. Furthermore, the heart contained roughly twice as much CoQ10 as the kidneys, the organ/tissue with the second-highest

CoQ10 concentrations in the study. Non-cardiac muscle had only one-third of the CoQ10 of the heart muscle.[196]

CoQ10 also promotes the function of the mitochondrial ETC by supporting the electron transfer in complexes I and II, as well as by its established role in complex III. Its impact in restoring heart function in cardiomyopathy has been significant and sometimes stunning, especially since this is a condition that is only given supportive care by traditional cardiologists who appear to remain unaware of this highly therapeutic nutritional supplement, even in the face of solid scientific data in the medical literature.

In a randomized, double-blind trial in 420 patients with severe heart failure, and followed for two years, there was a ***42% reduction*** in all-cause mortality and cardiac mortality in patients given 100 mg of CoQ10 three times daily. Fewer hospitalizations for heart failure occurred in the treated group as well.[197] The supplementation of selenium along with CoQ10 appears to be especially effective in reducing mortality in cardiomyopathy patients.[198]

**In a randomized, double-blind trial in 420 patients with severe heart failure, and followed for two years, there was a *42% reduction* in all-cause mortality and cardiac mortality in patients given 100 mg of CoQ10 three times daily.**

The ejection fraction (EF), a measure of how effectively the heart contracts and empties with each beat, is the most objective and readily measurable parameter for evaluating cardiac function. EFs considered to be normal run roughly from 65% to 80%. Many sources consider 50% to 70% to be the normal range. However, EFs in the 50% vicinity are already demonstrating a significant loss of cardiac function, even though enough cardiac function is present to meet the demands of the typical older

lifestyle. EFs of 10% to 15% represent the most significant loss of cardiac function and are characteristic numbers for patients with massive heart enlargement on heart transplant waiting lists. CoQ10 supplementation has rescued many patients considered to have terminal heart failure, and this has been accompanied by dramatic improvements in EF and functional capacity in most patients, with one study showing the mean EF going from 25% to 42%.[199-204] It should also be noted that increasing an EF from 15% to 25% can transform a patient who has difficulty walking across the room without shortness of breath into one who can function normally, as long as major physical stresses are avoided.

The initial pathology seen in the heart failure of hypertrophic cardiomyopathy with preserved EFs is also clearly improved with CoQ10 supplementation.[205-206]

Low CoQ10 levels, along with increased CRP (C-reactive protein, a marker of oxidative stress) levels, have been documented in heart failure, whether due to coronary disease or of unknown cause.[207] Other studies have also shown that lower CoQ10 serum levels correlated with increased all-cause mortality in general, as well as in heart failure patients.[208-209]

Conversely, CoQ10 supplementation has been shown to decrease all-cause mortality in all subjects. Furthermore, CoQ10 supplementation has been shown to increase exercise capacity in patients with heart failure, with no significant adverse effects or safety issues reported.[210-213] First discovered in 1955, the benefits of CoQ10 in heart failure have been extensively documented in the scientific literature for over 50 years. Yet, established textbooks of medicine and medical therapeutic manuals make ***no mention*** of this vital nutrient antioxidant, let alone its impact on congestive heart failure.[214-218]

As CoQ10 increases energy production in all cells of the body, it should not be surprising that studies have shown its benefits in a wide variety of diseases. Low levels have been documented in many medical conditions, along with evidence of its clear benefits when administered properly or supplemented. Such conditions include the following:

- ✓ Brain disorders, including Parkinson's disease, Alzheimer's disease, stroke, and depression[219-222]
- ✓ Autism[223]
- ✓ ADHD (Attention Deficit Hyperactivity Disorder)[224]
- ✓ Hypertension (high blood pressure)[225-228]
- ✓ Coronary artery disease (atherosclerosis) and acute myocardial infarction[229-232]
- ✓ Improved clinical outcome post-coronary bypass and post-coronary angioplasty[233-234]
- ✓ Atrial fibrillation[235]
- ✓ Asthma[236-237]
- ✓ Obesity[238]
- ✓ Fibromyalgia[239]
- ✓ Diabetes (improved glucose and lipid profile)[240]
- ✓ Multiorgan failure when genetically deficient[241]
- ✓ Improvement in chronic kidney disease[242]
- ✓ Chronic lung disease[243]
- ✓ Fatty liver disease[244]
- ✓ Chronically increased oxidative stress[245]
- ✓ Vertigo[246]
- ✓ Sepsis and any critical illness[247-249]
- ✓ Statin cardiomyopathy[250]
- ✓ Statin myopathy (skeletal)[251]
- ✓ Eye disease[252]

As CoQ10 is one of the few vital antioxidants that the body synthesizes, aging accounts for much of its deficiency. Older people typically produce less CoQ10, generally have a lower dietary intake of it, and often have other medical conditions that necessitate a higher consumption of it. The average 80-year-old has approximately 50% of the cardiac CoQ10 content compared to the average 20-year-old.[253-254] But its importance in cardiac function is the same regardless of age. Just as deficient hormone levels need to be restored to optimize health in the aging patient, CoQ10 also needs to be addressed, as it is essential for the optimal health of all cells.[255]

Additional supplementation can specifically target complexes I, II, and IV in the mitochondrial ETC to help optimize ATP production. Not only will such supplementation be beneficial to all cells of the body, but the increased ATP demands of the heart make them especially suited to help support and improve the function of a failing heart.[256]

NAD (nicotinamide adenine dinucleotide) is the primary substrate fueling complex I. The primary way to keep NAD levels high, in addition to directly supplementing NAD itself, is to take large amounts of its primary precursor for being synthesized in the body. This role is served by niacin (vitamin B3) and its vitamers (like niacinamide).[257] Levels of both NAD and ATP have been documented to be significantly depressed in cardiomyopathy biopsy specimens.[258] Like CoQ10, niacin significantly improves all cardiovascular conditions, not just cardiomyopathy.[259-269]

A severe niacin deficiency state has also been documented to be the root pathology in schizophrenia and other brain disorders, consistent with the high ATP requirements of the central nervous system for normal function.[270] Severe niacin deficiency results in pellagra, a life-threatening condition that is also associated with diminished heart contractility.[271-273]

Riboflavin (vitamin B2) also plays a critical role in optimizing mitochondrial ATP production. It serves as a precursor, or building block, for FAD, the electron-transferring substrate in complex II of the ETC.[274] An animal study demonstrated that riboflavin can alleviate heart failure and improve cardiac metabolism.[275] It can also lessen the amount of damage that reduced blood flow, or ischemia, will inflict on the heart.[276] A genetic deficiency of complex II results in an advanced congestive cardiomyopathy, indicating its importance in this condition.[277] When FAD is targeted as an antigen by anti-mitochondrial antibodies, a dilated cardiomyopathy results as well.[278]

Complex IV of the ETC, involving the transfer of electrons via cytochrome c oxidase to oxygen, the terminal electron acceptor, is strongly supported by methylene blue (MB).[279] MB is a powerful redox agent that has been shown to benefit neurodegenerative diseases by increasing mitochondrial energy production.[280-283] Promoting ETC ATP production by directly supporting complex IV is especially significant since the obligatory oxidative stress generated in the first three complexes is avoided. This means that less net oxidative stress is generated in the cell without compromising ATP production, a rarely achieved therapeutic goal.[284] This effect is also why MB has been promoted as an anti-aging agent, as cumulative oxidative stress is a primary cause of all aspects of aging.[285] In cellular studies, MB delays the aging process.[286]

Consistent with its documented brain benefits, MB has also been shown to protect and heal the heart. Well-documented to completely rescue and cure patients with refractory septic shock resistant to all other measures as a *monotherapy*, MB was also able to improve cardiac function in a septic shock patient who already had an advanced cardiomyopathy.[287-289] Other studies have consistently confirmed the positive effect of MB on septic shock.[290-291]

Advanced states of hemodynamic shock without sepsis have also been resolved by MB treatment.[292] In animal studies, MB not only improves ETC energy production but also decreases oxidative stress and improves NAD levels in the mitochondria.[293-294]

## Recap

The heart muscle in all cardiomyopathies is depleted in ATP, the most critical energy-producing molecule in the body. The worse the cardiomyopathy, the more severe the depletion. ***Nearly all the time***, this ATP-depleted state is precipitated and maintained by heavy metal accumulations, often accelerated by earlier pathogen-provoked myocardial inflammation (myocarditis). Such myocarditis is typically undetectable on routine laboratory tests, and only more invasive testing can confirm its presence.

> **When a patient presents with an enlarged, poorly contracting heart, it must be assumed that significant heavy metal accumulations are present, and the treatment protocol must include chelation/toxin mobilization therapy.**

Depending on the patient's history and laboratory findings, the clinician must also determine whether chronic COVID-19 with persistent spike protein-mediated inflammation is a significant (or a major part of) the underlying pathology. If this is confirmed, or if clinical suspicions are high, measures to eradicate the spike protein should be vigorously pursued.

In addition to the heavy metal/toxin removal measures, targeted supplementation designed to directly support and heal the failing ability of the cardiac mitochondria to produce normal levels of ATP is ***essential*** for an optimal cardiac and clinical response. This supplementation will be discussed in Chapter 18.

**Even if there is a refusal to acknowledge the likely presence of heavy metals in the failing heart muscle, which will continue to be the rule rather than the exception among traditional cardiologists, nontoxic non-prescription nutrient chelators and ATP production promoters can still be taken as desired, and substantial benefit can still be anticipated.**

Chapter 6

*If you want to make enemies, try to change something.*
Woodrow Wilson

# How Toxins Cause Coronary Artery Disease

## Relationship Between Coronary Artery Disease and Scurvy

A strong immune system protects against all diseases and medical conditions. However, despite its seeming complexity, the ultimate goal or function of the immune system is to ***restore cellular vitamin C levels to normal.*** When this can be accomplished, previously diseased cells and tissues are restored to their normal state.

Coronary artery disease (CAD), also known as ischemic heart disease, is the underlying condition that often results in myocardial infarction, or heart attack. Heart disease, primarily CAD, continues to singularly claim more lives in the United States than any other disease, infection, or medical condition.[1] Heart disease death rates have flattened a little in recent years, presumably due to improved interventional cardiology. However, no significant advances have been made in understanding, preventing, and even resolving or reversing this condition.

CAD is characterized by the development of narrowings (atheromas) in the coronary arteries that eventually completely obstruct these vessels, resulting in the death of heart muscle, commonly known as a heart attack.

Scurvy is an inevitably fatal disease that occurs when enough vitamin C is not regularly ingested. It is traditionally regarded as a systemic, or bodywide disease, affecting all organs and tissues in the body. However, when conditions severely deplete vitamin C in just a specific tissue or area of the body, a state of "focal scurvy" is present. This also results in predictable pathophysiological changes in the affected tissue when vitamin C depletion is chronic and severe in degree. Advanced focal scurvy typically occurs in atherosclerotic arteries, even when there is no evidence of systemic vitamin C deficiency.[2]

## Inflammation and CAD

Just as inflammation is considered a cause of many different diseases, it is also regarded as the direct cause of all CAD by most traditional cardiologists and internists.[3-5] However, there is little curiosity as to what is provoking this "pandemic of inflammation" that is causing this deadly disease.

Intrinsically, inflammation is the reaction to something else. In other words, what is "causing the cause?" Inflammation is only the outer layer of the onion that needs to be peeled away to find out what the real source of pathology is in all the diseases for which inflammation is claimed to be the primary cause.

When a 50-year-old man has a heart attack but is entirely free of all known risk factors for heart disease, the treating cardiologist considers that individual to have had bad luck. However, that sentiment is never directly expressed to that individual. No doctor wants to appear clueless to the patient.

Truth be told, luck ***does*** play a role in whether someone develops heart disease. However, it pertains more to the luck

involved in whether that individual was treated by a well-informed biological dentist earlier in life rather than by just a procedure/tooth structure-oriented mainstream dentist who has no awareness of, or concern with, the dynamic physiological interplay between the mouth, its common oral infections, and the rest of the body.

## CAD Pathophysiology

In *Circulation*, the leading subspecialty journal for cardiologists, a study examined the presence of pathogenic bacterial species in atherosclerotic plaque specimens obtained from 38 patients with known coronary heart disease. The specimens were obtained via catheter-based atherectomy, a procedure in which much of the obstructing plaques are scraped or carved out with a special catheter. All 38 patients underwent polymerase chain reaction (PCR) testing of the plaque specimens that were removed. This testing revealed the DNA signatures of various pathogens in all of the plaque specimens, including many classically seen in oral infections, with over 50 different species identified.[6] In 92% of those specimens, the DNA of 2 to 9 different species of fungus was detected as well. Control specimens revealed no evidence of either bacteria or fungi.[7]

**Advanced focal scurvy typically occurs in atherosclerotic arteries, even when there is no evidence of systemic vitamin C deficiency.**

Other studies have also shown a high incidence of pathogens, including viruses, in atherosclerotic plaques in the coronary arteries and elsewhere in the vascular system. The documentation of pathogen presence in the arterial blockages was not seen in 100% of the specimens, as noted in the atherectomy study described above. However, pathogens were found most of the time, and in some cases, the rate approached 100%.[8-17] However, this does not exclude pathogens as being present in all cases of

atherosclerosis, since pathogen testing is often narrowly focused and not designed to detect organisms from all pathogen categories, including bacteria, viruses, fungi, and protozoa.

> **The inescapable conclusion of all these studies is that chronic pathogen colonization (versus overt infection) is consistently found in the walls of atherosclerotic blood vessels, in both the coronary arteries and throughout the arterial vasculature. Additionally, pathogens typically associated with oral or periodontal origins were most commonly identified.**

Patients presenting with myocardial infarctions secondary to acute coronary occlusions precipitated by soft platelet clots depositing on atherosclerotic plaques were investigated as well. These clots were aspirated at angiography and analyzed by PCR testing. The overwhelming majority of these clots had DNA signatures from periodontal (oral) pathogens. Furthermore, the concentration of this DNA was 16-fold (1,600%) higher in those clots than in the surrounding blood. It would defy logic to consider these pathogens as anything other than the ***primary reason*** for that clot developing on the atherosclerotic plaque. However, the authors would only go so far as to conclude that the clots "may be associated" with the oral bacteria that accumulated inside them![18] In the medical literature, it is almost impossible to find an article that definitively concludes a cause-and-effect relationship between any factor and

**The inescapable conclusion of all these studies is that chronic pathogen colonization (versus overt infection) is consistently found in the walls of atherosclerotic blood vessels, in both the coronary arteries and throughout the arterial vasculature.**

any outcome. Rather, the boldest conclusion that is ever reached is that an association, correlation, or relationship of some sort is present, followed by the ever-present advice that "more" studies are needed.

## Chronic Pathogen Colonization Causes Atherosclerosis

The effects of chronic pathogen colonization (CPC) in an arterial wall both ***initiate and sustain*** the evolution of atherosclerosis. Wherever CPC is established, pro-oxidant (toxic) molecules are continuously produced as a secondary effect of pathogen metabolism. Many pathogens produce specific endotoxins and exotoxins in addition to the toxic byproducts of their metabolism. Furthermore, when pathogens eventually die and decompose, a significant amount of highly toxic free iron is also released. As a direct result of this chronic pro-oxidant effect of CPC, its presence in the arterial wall quickly depletes the antioxidant content, particularly that of vitamin C. The ongoing presence of this CPC also ensures that affected areas of the arterial wall will never again return to their normal antioxidant status until the CPC is resolved. Supplemental vitamin C will always help, but to a variable degree, depending on the extent to which the CPC is entrenched in the arterial wall and how readily it produces toxins into its surrounding environment. Some patients have been reported to demonstrate regression of atherosclerotic lesions by taking large doses of vitamin C, while leaving the underlying focal infections unaddressed.[19] In guinea pigs, atherosclerosis is completely reversible by vitamin C, with the earlier stages reversing much more rapidly than the later stages.[20]

However, most heart patients can only realistically hope for stopping or slowing the atherosclerotic process by taking vitamin C without resolving the seeding sites of infection. Once the pathogen presence in the arterial wall metabolizes all the vitamin C present,

and virtually no measurable amounts of reduced vitamin C remain, an inflammatory state exists. Inflammation cannot exist where vitamin C levels are normal or near normal. CPC in the arterial wall results in a state of focal scurvy (severe vitamin C deficiency). Acute focal vitamin C deficiency and acute focal inflammation are synonyms for the ***same*** physiological state.

**And as incredibly complex as the immune system is known to be, it is always inflammation that triggers the immune response, and a severe and copper deficiency vitamin C deficiency is always the underlying cause.**

The presence of inflammation or severe focal vitamin C depletion directly triggers the acute immune response. Inflammation does not occur spontaneously without vitamin C depletion, which is often associated with the presence of advanced oxidative stress inflicted by local areas of CPC. Such sites of advanced oxidative stress can only exist where vitamin C has been severely depleted, often to the point of undetectability.

The acute immune response, which seeks out sites of inflammation in the body, exhibits several noteworthy characteristics. The first cells to mobilize and reach the inflamed tissue are monocytes, which are heavily laden with vitamin C, significantly more so than any other cell type. The concentration of vitamin C in monocytes is more than 80-fold (8,000%) higher than the surrounding plasma. Regular white blood cells, while still having relatively large concentrations of vitamin C, have only about one-third of the concentration seen in monocytes. Monocytes also have higher levels of magnesium than regular white blood cells.[21] Furthermore, they also produce hydrogen peroxide in response to sites of inflammation and infection.[22-23] More magnesium and increased availability of hydrogen peroxide are factors that directly and indirectly support

the restoration of vitamin C levels by killing pathogens and reducing oxidative stress in the arterial wall.

Unlike the white blood cells, the monocytes can also maintain their high vitamin C content in the face of lowered plasma concentrations.[24-26] In cell cultures, human monocytes were able to maintain a vitamin C concentration gradient of 100-fold across the plasma membrane.[27] Additionally, platelets are part of the initial response of the immune system to inflammation, and they also have high concentrations of vitamin C.[28]

The cells leading the acute immune response indicate that the prompt delivery of highly concentrated vitamin C is the crucial part of the mechanism by which the immune response alleviates the inflammation that has developed. And as incredibly complex as the immune system is known to be, it is always inflammation that triggers the immune response, and a severe vitamin C deficiency is always the underlying cause. Just as vitamin C deficiency results in inflammation, vitamin C repletion resolves it when sufficient amounts can be delivered through the immune response that is triggered.

> **Despite its numerous metabolic pathways and components, the primary goal of the immune response is to restore normal vitamin C levels at the site of inflammation, along with the resolution of any pathogen colonization that continues to deplete vitamin C.**

If the initial pathogen presence is transitory, the acute immune response will promptly resolve the associated inflammation as the pathogens are killed and the increased oxidative stress is completely neutralized in the arterial walls. However, when remote focal infections, typically oral, remain unresolved and the seeding of pathogens continues "24/7," the acute immune response transitions into a chronic immune response, attempting to deal with chronic inflammation. This brings other factors into play as atherosclerosis evolves.

The earliest pathological impact of deficient vitamin C status in the arterial wall is observed in the extracellular matrix (ECM) surrounding the endothelial cells that line the inner wall.[29] The ECM is also known as the basement membrane when associated with endothelial cells.[30-31]

**It is also important to note that atherosclerosis-promoting agents, such as cholesterol, can only exacerbate the *progression* of established atherosclerosis.**

The basement membrane typically has a high content of collagen and interconnected glycoproteins, which give it a thick, gel-like consistency. Relatively large amounts of vitamin C are needed to maintain good levels of healthy collagen and glycoproteins in the basement membrane.[32-33] When there is little to no vitamin C present, the jelly-like state degrades to a less intact, and even watery state, and the spaces between the endothelial cells expand, initiating what is known as the ***degenerative*** stage of atherosclerosis.[34] This weakened basement membrane allows the uptake of calcium, cholesterol, fats, and even more pathogens/toxins from the bloodstream into these spaces. This degeneration of the endothelium and general weakening of the arterial wall also leads to repeated small bleeds in the wall, known as intimal hemorrhages. These bleeds contribute to the progression of atherosclerosis and make larger plaques increasingly unstable, with the potential to initiate clotting responses that block the artery and result in an acute heart attack.[35]

Monocytes from the immune system then appear and transition into phagocytic macrophages, which engulf these accumulating substances and enter the endothelium. These lipid-stuffed macrophages become the bubbly-appearing foam cells, which collectively become visible to the naked eye as the fatty streaks that herald the clear beginning of atherosclerosis.[36-37] It is also important to

note that atherosclerosis-promoting agents, such as cholesterol, can only exacerbate the ***progression*** of established atherosclerosis. Cholesterol is unable to ***initiate*** atherosclerosis if the arterial wall has a normal content of vitamin C and the basement membrane is completely intact.

**The degenerative stage of atherosclerosis then proceeds to the proliferative stage of atherosclerosis.**

This stage features the influx of fibroblasts, another cell type with a high concentration of vitamin C, which accumulates against a concentration gradient of up to 20-fold.[38] Fibroblasts are crucial to producing new collagen and much of the protein content in the ECM and the basement membrane, and the fibroblasts need sufficient vitamin C to accomplish this.[39] The recruitment of fibroblasts is a compensatory mechanism to fortify and strengthen the ECM that was weakened and rendered watery by the depletion of vitamin C.[40-41]

However, as long as vitamin C remains depleted by the ongoing presence of the pathogen in the arterial wall, the fibroblast influx will continue and proliferate in a futile attempt to synthesize enough high-quality connective tissue to restore the wall to a normal state. The proliferative phase of atherosclerosis will never stop as long as vitamin C levels remain low or absent, and the secondary immune response remains chronic.

**The continuous influx of immune cells, including fibroblasts, is a result of chronic inflammation. It is the *chronic immune response to chronic inflammation* that continues to build up plaque, ultimately leading to the complete blockage of the artery. *Nothing* turns off this chronic immune response other than the restoration of normal vitamin C levels in the arterial**

**wall, which can only occur when the CPC has completely resolved.**

One hypothesis on the development of atherosclerosis is that since quality collagen and other forms of connective tissue will never be restored to normal levels in the absence of adequate vitamin C, the "next best" compensatory response for a wall that will never again have normal tensile strength is to make it thicker, as in the growth of atheromas (plaques).[42-43]

One of the most significant substances that reinforces the vitamin C-deficient arterial wall is lipoprotein(a), a lipid formed in the liver, with increasing amounts synthesized as vitamin C levels decline.[44] The administration of vitamin C has been shown to lower plasma lipoprotein(a) levels while preventing its deposition in the vascular wall. Vitamin C also works to displace and release lipoprotein(a) that is already bound to the vascular wall. Lysine, proline, hydroxyproline, and niacin (but not niacinamide) all bind lipoprotein(a), which lessens the ability of any circulating lipoprotein(a) to bind fibrinogen and fibrin, components of the atherosclerotic plaque.[45-49] Properly dosed vitamin C, lysine, and proline have resulted in stunning clinical improvements in patients with severe angina and documented advanced coronary artery disease.[50-53] Consistent with these findings, lipoprotein(a) has been identified as an independent coronary artery disease risk factor.[54-56]

**Autopsy studies have confirmed that vitamin C is consistently depleted and *often completely absent* in atherosclerotic arterial walls and plaques.**

Any compensatory mechanism in the body ultimately aims to keep the body alive. An arterial wall thickened by growing plaques fueled by lipoprotein(a) deposition, along with the cellular proliferation seen with the chronic immune response, will be much less likely to develop arterial aneurysms that eventu-

ally rupture and cause sudden death. This works for an extended period in many people, at least until the atheromas grow so large that the coronary artery becomes completely occluded. Essentially, it appears that the atherosclerotic plaque grows where supportive connective tissue is lacking, to support survival when vitamin C is not replenished in the vessel wall. Also, lipoprotein(a) has been shown to accumulate in coronary artery bypass grafts that have developed atherosclerosis.[57-59]

**A sufficient presence of vitamin C is the most critical factor in healing anywhere in the body.**

Regardless of the mechanism, as long as the vitamin C levels in the atherosclerotic arterial wall remain low to immeasurable, atheromas will continue to grow. And as long as the CPC in the arterial wall continues to consume all vitamin C present and remains unaddressed, atherosclerosis cannot resolve, or even slow down significantly in its progression. Autopsy studies have confirmed that vitamin C is consistently depleted and ***often completely absent*** in atherosclerotic arterial walls and plaques.[60] Furthermore, in an atherosclerotic animal model, the administration of sufficient vitamin C would ***reverse and even resolve atherosclerotic plaques***.[61] A daily dose of only 1,500 mg of vitamin C in patients with peripheral atherosclerosis was able to halt progression and even induce regression in the majority of those treated, as documented by angiography.[62]

## Atherosclerosis, the Non-Healing Wound

The definition of a wound is damage to the integrity of biological tissue, including skin, mucous membranes, and organ tissues. When infection or pathogen colonization is present, versus an acutely inflicted but "clean" wound, healing is always dependent on resolving the pathogen-induced inflammation, along with the focal vitamin C deficiency that results from the colonization or infection.

Similarly, the resolution of atherosclerosis follows the principles of basic wound healing. Classical atherosclerosis is a non-healing wound resulting from ongoing pathogen-induced vitamin C deficiency. As long as the inflammation-induced chronic immune response secondary to the focal vitamin C deficiency remains unaddressed, good healing will never occur. Like acute inflammation, chronic inflammation requires vitamin C to resolve. Without vitamin C, chronic inflammation worsens atherosclerosis rather than improves it, due to the continued presence and proliferation of various immune cells that are recruited to the area of the growing plaque.[63]

Furthermore, the healing requirements for wounds inside and outside the body are much the same. Fibroblasts, which are needed to achieve normal healing, cannot function normally in the absence of the vitamin C required to regenerate a normal basement membrane or ECM. Chronic atherosclerosis and poor healing wounds are characterized by inflammation- and infection-induced elevated oxidative stress, and vitamin C is consistently depleted at these sites.

In any vitamin C-depleted microenvironment, routine healing will never be realized until the vitamin C status is restored. However, healing of some wounds with a poor quality of resolution can occur when suboptimal amounts of vitamin C are available. Cancer, especially at metastatic sites, is a condition also regarded as a non-healing or chronic wound in the literature, and very elevated levels of oxidative stress are always present.[64] Intravenous vitamin C has been reported to be an effective treatment for cancer patients, even when the cancer is advanced.[65]

A chronic bedsore is a classic example of an external open wound that often responds poorly to traditional wound treatment protocols. Patients with such lesions are typically invalids with an overall poor vitamin and nutritional status. However, such open wound healing is significantly enhanced by insulin, ***a hormone that***

***dramatically facilitates the uptake of vitamin C inside the cells of the infected tissue***.[66-67] A sufficient presence of vitamin C is the most critical factor in healing anywhere in the body.[68-70]

## Recap

Coronary artery disease, killing more people than any other single condition, is a perfect example of the critical negative impact of chronic pathogen colonization (CPC). Most, if not all, chronic degenerative diseases exhibit some degree of CPC in the affected organs or tissues, thereby skewing the redox balance toward excess oxidation of cellular biomolecules. The only exception would occur when a chronic disease is being sustained by a unique and high exposure to a non-infection-related toxin source, such as might occur environmentally. For such an exception, a vigorous intake of antioxidant nutrients and supplementation would likely reverse the disease in question.

Disease anywhere in the body is characterized by tissue with a continuing source of new pro-oxidants, more than the arrival of new electrons, and sufficient antioxidants to distribute those electrons properly. Focal areas of disease have the characteristics of a non-healing wound. A wound heals when new toxins (typically produced by pathogens) are curtailed, and a large influx of antioxidants, especially vitamin C, can be assured.

Studies indicate CPC is always found in the coronary arteries of such individuals, keeping the artery in a chronic focal state of scurvy with little or no vitamin C present. Until vitamin C depletion is halted, atherosclerotic plaques continue to grow and eventually cause heart attacks by completely blocking the affected artery.

When the oral focal infections seeding the coronary arteries can be identified and eliminated, and optimal supplementation and hormone levels can be maintained, atherosclerosis stabilization is almost certain to occur. Atherosclerosis reversal, sometimes returning to normal, can also be observed.

A (CBCT) examination of the oral cavity is as (or more) essential than ***any other testing*** involved in the proper evaluation and treatment of any suspected or documented heart disease patient. This 3D X-ray remains the only way to accurately know if deadly but pain-free abscessed teeth are present.

For more detailed information regarding the treatment of Coronary Artery Disease, see Chapter 18.

## Chapter 7

*The only true wisdom is in knowing you know nothing.*
Socrates

# How Toxins Cause Cancer

## Toxic Origins of Cancer

Chronic pathogen colonization (CPC) and focal infection are the leading causes of focally elevated oxidative stress where they are found. Cancers originate in tissues where the oxidative stress, or levels of increased intracellular biomolecule oxidation (IBO), are highest. Identifying and eliminating all CPCs and focal infections in cancer, or any other disease process, must always be addressed early and thoroughly in any treatment protocol. Repairing oxidative damage helps patients greatly, but it will always fall short of optimal therapy when the new daily toxins (as are produced by pathogen growth) remain unaddressed.

All cancers begin because of a toxic load that remains unneutralized over an extended period. Although not all cancer-causing toxins originate from a focus of infection, one of the most common cancers, breast cancer, frequently does. Certainly, there are many types of cancer and differing pathophysiologies and treatment protocols for each, but breast cancer

will be discussed here as an illustration of how cancer develops from chronic toxic exposures and an example of how necessary the removal of the toxic exposure is in the treatment of all cancers.

Breast cancer causes enormous morbidity and mortality around the world, and its traditional treatment, along with the relentless progression of the disease, significantly impacts the quality of life for both patients and their families. Women are almost exclusively affected by this cancer, as only about 1% of cases occur in men.[1] Yet, despite its predilection for women, breast cancer is still the most statistically common of malignancies (aside from non-melanoma skin cancers) in the overall population. It continues to be the leading cause of cancer deaths across the planet.[2]

## Redox Biology and Toxins

Reduction and oxidation refer to the movement of electrons between molecules. When a normal biomolecule with a normal electron content is depleted of one or more electrons, it becomes oxidized. And when that oxidized biomolecule can regain the lost electron(s), it returns to a normal, reduced chemical state. A reduced biomolecule functions normally, while an oxidized biomolecule either wholly or partially loses its normal chemical/biological function.

Furthermore, the accumulation of these mostly inert, oxidized biomolecules interferes with normal chemical reactions because they occupy space and, as a result, can physically limit how effectively normal biomolecules can interact metabolically. Examples of biomolecules include sugars, fats, proteins, enzymes, nucleic acids, and structural molecules. Increased

oxidation ***IS*** disease, and the unique pattern of increased intracellular biomolecule oxidation (IBO) caused by the chemical characteristics of one or more toxins determines the clinical presentation of the disease.

Redox (reduction-oxidation) biology is based on the concept that all biological health is directly due to the degree of reduction versus oxidation in the biomolecules throughout the body. Higher reduction/oxidation ratios indicate good cellular health. This has led to the frequent use of the term "oxidative stress" as the premier biomarker and measuring stick of all disease.

**As pathology cannot exist in the absence of excess oxidation, there are no exceptions to this premise.**

Widely discussed in the medical and scientific literature, increased oxidative stress, or the excess presence of oxidized biomolecules, is ***always*** the primary pathophysiology of any disease under consideration.[3-4] It is characterized by a relatively low antioxidant presence and/or an increased pro-oxidant presence. At the cellular level, ***all*** diseases and medical conditions are characterized by increased oxidative stress in the cells of the affected organs or tissues. The extracellular areas are often involved as well. As pathology cannot exist in the absence of excess oxidation, there are no exceptions to this premise.

Discussed in more detail elsewhere (see Chapter 2), focal infections, typically located in the mouth, are the most significant sources of clinically relevant toxins generated within the body. Pathogens are toxin-generating machines, and nothing matches their ability to create the highest degrees of oxidative stress where they are found. For breast cancer, this begs the following questions:

- ✓ What is the source of the toxins in breast cancer, and
- ✓ What is causing them to accumulate excessively?

## Breast Cancer Pathophysiology

All chronic degenerative diseases, including cancer, only arise when an area of affected tissue becomes substantially inflamed and remains that way. And for cancer to develop, it is only the areas in the body that have ***exceptionally increased and chronic*** oxidative stress that permit malignant transformation of the exposed cells. Minimally increased focal oxidative stress generally will not trigger such a transformation. Rather, lesser degrees of increased oxidative stress, depending on their location, underlie the development and maintenance of all the other non-malignant diseases. But the highest chronic elevations of oxidative stress, both intracellularly and extracellularly, are the reasons for the initiation and evolution of cancerous growth. ***No cancer has ever developed in an area that was not already inflamed***. This also means that a cancer will never manifest in cells that have normal levels of vitamin C. While a cancer can metastatically seed malignant cells in a previously normal tissue site, the primary cancer focus will ***never*** be initiated in normal, uninflamed tissue.

**No pathology of any kind can develop when a tissue has intracellular and extracellular levels of oxidation that are within physiological limits (resulting from normal metabolism), and normal levels of vitamin C are present.**

A substantial and chronic presence or accumulation of toxins always precedes malignant transformation in the affected areas of the breast. These toxins are produced by slow-growing pathogens (colonizations), and the pathogens themselves can often be found at the cancer site as well. But toxins (highly pro-oxidant molecules) must always be present to provoke and sustain a state of chronic and severe inflammation. The amount of time that such a toxin/pathogen accumulation needs to be present to stimulate malignant transformation is highly variable. Some women with robust immune systems, high antioxidant intake, and a relatively low degree of toxin/pathogen presence may never manifest malignant transformation. Of note, even benign breast lumps and other forms of breast pathology can result from lesser degrees of toxin exposure.

> **No pathology of any kind can develop when a tissue has intracellular and extracellular levels of oxidation that are within physiological limits (resulting from normal metabolism), and normal levels of vitamin C are present. Only increased levels of oxidation can result in cellular pathology.**

In addition to blood circulation, the body also has a separate system of lymphatic circulation. This circulation moves lymph, a plasma-like extracellular fluid that bathes the cells throughout the body, into the venous blood circulation. Under normal circumstances, this lymph flow is one-way only in the direction needed to reach the blood.[5] The primary role of the lymphatic circulation is to provide an outlet for cellular waste products, excess water, and toxins, as well as to support an immune defense against pathogens.[6] It also periodically condenses into focal bodies known as the lymph nodes.

These lymph nodes, of which there are about 500 to 600 in the body, work to concentrate B- and T-lymphocytes needed to combat the infectious agents that are encountered as the lymph is drained, such that the lymph itself is typically rendered sterile by the time it leaves the lymph nodes and reaches the blood.[7-8] When draining a source of infection, lymph nodes will readily enlarge and become sore, which can be felt (palpated) in areas such as the neck, armpits, or groin. Once the lymph finally reaches the bloodstream, multiple ways of metabolizing and excreting the remaining non-infectious extracellular debris become available.

**While a cancer can metastatically seed malignant cells in a previously normal tissue site, the primary cancer focus will *never* be initiated in normal, uninflamed tissue.**

The breasts have an extensive lymphatic circulation, and much of their lymphatic drainage originates from the head and neck. A portion of the breast lymph subsequently flows into a large collecting vessel (thoracic duct) and then into the venous blood. The rest of it flows into the extensive lymphatic network in the armpits before eventually reaching the thoracic duct and the blood.

The lymphatic vessels have a limited ability to contract, promoting a one-way flow of lymph.[9] However, this lymphatic movement can be slowed, stopped, or even reversed in direction by the presence of sufficient inflammation and structural damage in the tissue being drained. When there is sufficient impairment of normal lymphatic flow, tissue swelling (lymphedema) can result.

In the breast, this impairment of lymphatic drainage can result from either chronic inflammation in the cancerous tissue

or, more commonly, following the surgical removal of cancer-laden axillary lymph nodes that drain the breast.[10-11] The fewer draining lymphatic pathways available, the more likely lymph flow will slow and accumulate. Together, both situations result in about 20% of women with breast cancer eventually developing arm swelling due to the back-up of lymph.[12-13]

As with tissues elsewhere in the body, the lymphatic system also drains the gums, the deep gum tissue (periodontium), and the teeth. This drainage largely follows gravity and is filtered in the lymph node network in the floor of the mouth and then the neck. From there, much of the drainage proceeds further down into the rich network of lymphatic vessels in the chest and the breasts, with most of the breast lymph then draining directly into the armpits.[14-16]

Periodontitis (deep gum infection) has been "linked" to many different cancers, including the breast. Of significant note:

> **Maintenance of periodontal health is effective in the primary prevention of breast cancer. This indicates that periodontal infection has a cause-and-effect relationship to breast cancer, not just a link, association, or correlation.**[17]

As more extensively discussed in Chapter 2, pathogens are the most common and prolific source of new toxins in individuals with chronic diseases or other medical conditions. Periodontitis represents the most extensively studied of the oral focal infections, and it has been linked to nearly every disease examined for this relationship. These links were cited earlier in detail. Resolving or significantly improving chronic periodontitis consistently lessens the severity of various chronic diseases. Breast cancer is no exception to this observation.

## Infected Teeth—The Hidden Pandemic

Chronically abscessed teeth, as seen in imaging studies, are prevalent. Furthermore, they are nearly always completely ***free*** of pain or any other associated symptoms, and the patient has no reason to suspect any problems in the mouth. ***This is why chronic diseases in adults are the rule rather than the exception.*** Too many physicians and their patients "expect" that hypertension, diabetes, cancer, or heart disease are the inescapable "norm" in the aging process of many older adults. Additionally, the deciduous (non-permanent or baby) teeth in children exhibit a high incidence of abscess formation.[18] When a child becomes chronically ill, a complete oral examination is just as critical as in an adult with a chronic disease. So, for all ages, the important takeaway point is that:

> **When the mouth is infection-free, all chronic diseases are very rare. And when a chronic disease is present, the growth of oral- or gut-derived pathogens in the affected tissue, accompanied by local toxin production, is almost always the cause.**

While some individuals, in a completely unpredictable manner, can have one or more root canals without any negative clinical consequences, this is very rare. However, significant laboratory abnormalities are often present even when a chronic disease is not yet manifest. Additionally, clinical medicine seeks a prompt and clear-cut relationship between an intervention and an adverse clinical outcome. With root canals and other chronically infected teeth, the leakage of pathogens and toxins can be slow, and breast cancer or a heart attack due to those infected teeth can take ***years*** to occur. Complications can occur rapidly after a root canal procedure, but this is not

a very common consequence. If that were the case, root canal treatments would have been abandoned long ago. But when someone gets breast cancer five years or more after a root canal, the status of the mouth is never considered as a possible reason by the traditional clinician or the patient.

A particularly aggressive pathogen of oral origin, *Fusobacterium nucleatum*, has been found in human breast cancer tissue. In an animal model, this pathogen has been demonstrated to promote tumor growth.[19-20] Higher titers of oral pathogens within breast cancer cells have also been shown to promote metastatic spread; experimental reductions in these titers decrease the chances of metastasis.[21] Animal studies have also demonstrated a similar pathogen profile in the mouth, gut, and breast tumors.[22]

***Some researchers have even termed breast cancer as an infectious disease***.[23] Many other studies have consistently found pathogenic microbes, ***including viruses and fungi***, in diseased breast tissue, including cancer, and much lower titers of non-pathogenic microbes in normal breast tissue.[24-32] As the mouth is always teeming with microbes (more than 700 different bacterial species), and its lymphatic circulation drains into the breasts, normal breast tissue is not free from microbes.[33-34] However, it should be pathogen-free, and the non-pathogenic microbes should typically be present in very low numbers and be difficult to culture.[35]

**Many other studies have consistently found pathogenic microbes, *including viruses and fungi*, in diseased breast tissue, including cancer, and much lower titers of non-pathogenic microbes in normal breast tissue.**

**Researchers found a *10-fold (1,000%) increase* in bacterial load in breast tumors relative to normal breast tissue.**[36-37]

## Chronic Disease and Chronic Pathogen Colonization

In addition to the enormous amount of literature cited above that unequivocally connects mouth infections to chronic diseases, several other studies warrant special attention, as they reveal that pathogens of oral and gut origin have been shown to ***chronically colonize*** different diseased tissues, resulting in continuous inflammation due to the on-site production of pathogen-related toxins. ***Breast cancer is but one of many infection-related chronic diseases. Chronic pathogen colonization (CPC)*** in diseased tissues is addressed more extensively elsewhere.[38]

Although it has not received the degree of research documenting the seeding of pathogens throughout the body from advanced periodontitis and chronically abscessed teeth, several noteworthy studies support the widespread presence of CPC and its direct disease-causing impact. These studies include the following:

- ✓ Pathogens in Alzheimer's disease brain tissue and cerebrospinal fluid[39-46]
- ✓ Pathogens in Parkinson's disease brain tissue[47]
- ✓ Pathogens in multiple sclerosis brain tissue and cerebrospinal fluid[48-49]
- ✓ Pathogens in amyotrophic lateral sclerosis brain tissue and cerebrospinal fluid[50]

- ✓ Pathogens in the coronary arterial wall and atherosclerotic lesions of coronary heart disease[51-54]
- ✓ Pathogens in intracranial aneurysms[55]
- ✓ Pathogens in abdominal aortic aneurysms[56]
- ✓ Pathogens in the acute blood clots causing myocardial infarctions[57-58]
- ✓ Pathogens in the acute blood clots causing lower limb thrombosis[59]
- ✓ Pathogens in the pericardial fluid surrounding the hearts of patients with coronary artery disease[60]
- ✓ Pathogens in the joints of patients with rheumatoid arthritis[61-63]
- ✓ Pathogens in the placentas of mothers with preterm and low birth weight infants[64-65]
- ✓ Pathogen antibodies in systemic lupus erythematosus patients[66-67]
- ✓ Pathogen antibodies in stroke patients[68-69]
- ✓ Pathogens in cancers:
    - Breast[70]
    - Oral, head, and neck[71-73]
    - Esophageal[74-75]
    - Liver disease and cancer[76]
    - Prostate[77]
    - Pancreatic[78-79]
    - Colorectal[80-81]
- ✓ Pathogens and chronic bodywide inflammation and chronic diseases in general[82-84]

**All chronic diseases require a *focal* source of new oxidative stress (toxins) in the affected tissue every day that exceeds the daily influx of antioxidant impact in that tissue to remain chronic.**

Otherwise, "chronic" diseases would resolve as the new antioxidant intake repairs (reduces) the old oxidative damage. This daily excess nearly always arises from chronic pathogen colonization in the diseased organ or tissue. New toxin exposure in the body comes from pathogen-generated toxins and the oxidized (toxic) byproducts of pathogen metabolism. Pathogens also release enormous amounts of pro-oxidant free iron when they finally die and break apart.

> **In breast cancer, oral pathogens collect and grow in the lymphatic tissue of the breast. When lymph flow slows, stops, or even reverses direction for a prolonged period, focal extracellular and intracellular oxidation intensifies to the point that malignant transformation occurs.**

## Recap

Breast cancer starts when infected lymph from infected teeth, gums, and tonsils drains into the breast to a degree that the lymph nodes and the immune system can no longer compensate against the oxidative stress of the chronic pathogen/toxin exposure that is not passing through the lymphatic drainage rapidly enough. Pathogens can readily be isolated from breast cancer cells and their surrounding extracellular environment. This is a ***cause-and-effect*** relationship between the presence of the pathogen and the development of cancer. It must never be dismissed as an unclear association, relationship, correlation, connection, link, or any other term that attempts to avoid concluding the fact that infected teeth cause cancer and chronic disease and result in chronic pathogen colonizations in the breasts and elsewhere in the body.

Breast cancer needs a comprehensive treatment protocol to achieve the best results, which often results in the disappearance of the cancer without surgery, radiation, or chemotherapy. However, the protocol must remove any seeding sites of pathogens to achieve a complete resolution or cure. Although various cancers typically occur in a specific organ or tissue within the body, any cancer still indicates a compromise in the body's overall immune status. And the tumor is not so much the disease itself, but rather the manifestation of compromised immune function in the face of a significant and unrelenting source of oxidative stress or toxins.

**Researchers found a *10-fold (1,000%) increase* in bacterial load in breast tumors relative to normal breast tissue.**

A healthy body does not "catch" cancer. Cancer only appears when a particular organ or tissue receives the most significant and most prolonged exposure to toxins, which nearly always comes from chronic pathogen colonization that was initially seeded by more substantial focal infections, as seen with infected teeth and gums. Any woman with any breast condition (including benign lumps) should first see a biological dentist and get a 3D X-ray (CBCT scan) of the mouth to identify and properly extract any abscessed teeth before proceeding to a physician.

In breast cancer patients, tonsils should always be treated as though they are infected, even if no other clear sites of oral infection can be found. It is essential to realize that cancer, especially of the breast, is a disease usuallylinked to the MOUTH, not the body or even the site where it is first found. Any cancer patient who does not get a 3D X-ray of the mouth

along with extraction of all root canals and other abscessed teeth is missing the most consistent and reliable way to initiate a tumor remission and eventually realize a cure.

See Chapter 19 for more detailed information on cancer treatment protocols.

## Chapter 8

*There are some people who, if they don't already know, you can't tell 'em.*

Yogi Berra

# How Toxins Cause Diabetes and Dementia

## The Common Cause

Like all other diseases and medical conditions, diabetes and dementia are conditions characterized by increased oxidation of biomolecules within affected cells due to toxin-induced damage. All the factors that positively and negatively impact these diseases are the same as those analyzed in other conditions in this book, from the perspective of the uniqueness of ongoing toxin exposure and the ability to slow or repair the oxidative damage that has been and continues to be inflicted.

Diabetes mellitus (DM) provokes a persistent and severe intracellular depletion of vitamin C, as the presence of excess glucose in the blood directly hinders cellular uptake of vitamin C. A large percentage of the vitamin C that ends up inside the cell depends upon insulin's ability to increase and sustain glucose cell membrane transporters (GLUTs).[1] As they

are chemically very similar molecules, circulating glucose and vitamin C directly compete for uptake via these transporters.[2] This results in much less vitamin C getting ushered into the cells when blood glucose remains high (and the diabetes is poorly controlled), as the excess glucose gets a continued preference for cellular uptake. This ongoing competition for entry into cells, which is chronically "won" by excess glucose, effectively means that similar toxin exposures result in even greater intracellular vitamin C depletion in diabetics than in non-diabetics. This also makes the potential normalization of intracellular vitamin C levels virtually impossible in patients with poorly controlled glucose levels.

**Although not generally recognized by clinicians and research scientists, DM is the *result of an epigenetic disorder* that many, but not all, people can compensate for without developing full-blown diabetes.**

While other cell membrane transporters specifically promote vitamin C uptake into the cells, the contribution of vitamin C transport via the insulin-stimulated presence of GLUT transporters is very important.[3-4] When excess glucose is competing with vitamin C for uptake by the GLUT transporters, the vitamin C-specific transporters cannot completely compensate for the decreased vitamin C uptake via this route, and a significantly depleted level of intracellular vitamin C will always result.

The presence of DM is associated with a 50% increased risk of dementia.[5] In fact, DM, also known as type 2 diabetes, is the most common form that typically appears with increasing age. The correlation between diabetes and dementia is so strong

that many researchers call the dementia in Alzheimer's disease "type 3 diabetes."

Neurons have an exceptionally high need for vitamin C to maintain normal function, and the presence of DM and higher degrees of insulin resistance make the maintenance of normal brain function impossible. Consistent with this, DM is associated as well with global brain atrophy (a decrease in the mass of brain tissue).[6]

Furthermore, common to all neurological disorders, ATP production is especially low in dementia, and stimulation of the electron transport chain inside neuronal mitochondria to make more ATP must be primarily targeted to effectively treat any neurological condition. Strong support of NAD production must be a major part of a protocol to lessen dementia, or any other neurological problem, involving both physical and mental symptomatology.

## Pathophysiology of Diabetes Mellitus (DM)

As discussed in Chapter 1, all disease is increased intracellular biomolecule oxidation (IBO). DM is no different, except that it is a bodywide metabolic disease, affecting not just specific tissues and organs. As such, poor glucose management in DM negatively impacts every cell in the body, making any other disease process that much more challenging to manage.

The effective management of DM is even more powerfully impacted in individuals who under-supplement or fail to supplement with high-quality nutrients, vitamins, and minerals, especially vitamin C and magnesium. As a metabolic disease,

DM is more sensitive to the lack of this support than many other diseases.

When vitamin C supplementation is substantial and taken daily, cortisol levels are reliably lower than in those who supplement little or no vitamin C. This is the case in patients diagnosed with functional hypercortisolemia due to unspecified stress.[7] The increases in circulating cortisol following ultramarathon running are also lessened by vitamin C supplementation.[8-9]

Cortisol release occurs in response to increased circulating oxidative stress and/or a significant new infection. In normal animal (but not human) livers, a reflexive production of vitamin C is stimulated as well, and the cortisol then proceeds to augment the uptake of the newly formed vitamin C into the cells throughout the body (see Chapter 11). Because of this unique action of cortisol on cellular vitamin C uptake, an acute consumption/depletion of intracellular vitamin C by the increased oxidative stress in the blood induces a consistent reflexive release of cortisol from the adrenal glands in an "attempt" to improve cellular vitamin C levels. However, when more vitamin C is not synthesized (or supplemented), intracellular vitamin C cannot be sufficiently increased, and the cortisol blood level becomes chronically elevated as a futile compensatory response.

As a result of chronically elevated cortisol levels, glucose levels also rise, as cortisol induces gluconeogenesis, a process in which new glucose is synthesized at the expense of protein breakdown, predominantly skeletal, resulting in a clinical picture of muscle wasting and atrophy. This chronic glucose synthesis that occurs in response to excess circulating cortisol, combined with the accumulating glucose that the genetically defective human liver is unable to utilize for vitamin C synthesis,

is likely the primary reason for the diabetes pandemic seen today. Many other factors can contribute to the development of diabetes as well, primarily in the form of poor diet and dietary toxins.

**Neurons have an exceptionally high need for vitamin C to maintain normal function, and the presence of DM and higher degrees of insulin resistance make the maintenance of normal brain function impossible.**

However, when vitamin C is significantly supplemented, there is less of a reflexive need for the adrenals to release more cortisol in the "hopes" that the defective human liver will make more vitamin C and use up more glucose. In animal studies, it has been demonstrated that a vitamin C deficiency leads to muscle atrophy and deterioration of physical performance, and that this condition can be reversed with vitamin C administration.[10-11] This also suggests why chronically excessive cortisol (or synthetic corticosteroids) can lead to diabetes or glucose intolerance, along with muscle wasting in the skeletal musculature. Independent of any consideration of the interactions between cortisol levels and cellular vitamin C levels, cortisol (and other glucocorticoids) have been well-established to induce skeletal muscle atrophy.[12-13]

Cancer patients, especially those who consume little or no vitamin C while receiving powerful toxic (pro-oxidant) chemotherapy agents, can be expected to elevate their cortisol levels on a chronic basis in response to their depleted cellular levels of vitamin C. Consistent with this, muscle wasting appears to be a common occurrence in the generalized clinical deterioration seen in chronic cancer patients.[14] The generalized administra-

tion of quality nutrient agents, including sufficient amounts of vitamin C, helps protect against muscle wasting.[15]

Cortisol physiology and its role in stimulating new glucose synthesis (gluconeogenesis) are not currently recognized as essential factors that need to be considered in the origin and management of diabetes. However, they are arguably the ***most critical*** factors, and DM will never be well-controlled, or possibly never even be present in the first place, until this vital interrelationship between cortisol, glucose, and the impaired biosynthesis of vitamin C in the human liver is fully appreciated.

The relationship between cortisol and intracellular vitamin C is supported by numerous studies that show the incidence of various diseases increases when cortisol levels are high, implicating low cellular vitamin C levels as a primary cellular pathology in all disease. Increased cortisol levels have been linked with heart disease and atherosclerosis, abnormal blood lipid and glucose levels, hypertension, stroke, suicide risk, obesity, markers of inflammation, and the ability to recover (heal) well and rapidly after a traumatic event.[16-21]

## Diabetes Mellitus Results from an Epigenetic Defect

Although not generally recognized by clinicians and research scientists, DM is the ***result of an epigenetic disorder*** that many, but not all, people can compensate for without developing full-blown diabetes. An epigenetic disorder is a change in whether or not a gene expresses itself. The change occurs through alterations in the ability of the DNA-generated mRNA to be translated rather than in the DNA sequence itself. In this case, the gene that would normally produce an enzyme needed

to convert glucose into vitamin C is effectively blocked from doing so.

It is unclear what "normal" glucose levels would be in a population of people who do not have this epigenetic defect. A normally functioning liver (as is seen in most ***animals***) has a four-enzyme sequence that continually converts glucose into vitamin C. And when a significant infectious and/or pure toxic stress appears in the blood, the animal's liver tremendously increases its production of vitamin C. At the same time, the adrenal glands are stimulated to release increased amounts of cortisol to meet that vitamin C in the blood and usher it into the immune and inflamed cells in the body, as well as into the remaining cells of the body to a lesser degree.

In humans, however, the fourth enzyme, L-gulonolactone oxidase (or GULO), is either inadequately present or unable to complete the conversion of glucose into vitamin C. This results in a chronic accumulation of glucose in the liver and the blood. Furthermore, when oxidative stress provokes the adrenals to release more cortisol into the blood, glucose levels are further increased to "support" the anticipated vitamin C synthesis since the cortisol also works to convert muscle protein into even more glucose (gluconeogenesis).

The importance of the relation between vitamin C and cortisol suggests that the ***primary*** role of glucose is to serve as a substrate for new vitamin C synthesis. However, the epigenetic inability of the human liver to utilize glucose for this synthesis, combined with the new synthesis of glucose stimulated by cortisol, results in an excess presence of glucose in all humans with this epigenetic defect (a defect nearly everyone in the world possesses).

As further evidence of this epigenetic defect, appropriate supplementation has been shown to partially restore the human liver's ability to synthesize vitamin C by helping to produce the missing enzyme (GULO). For more information about this epigenetic effect and its role in DM, see Chapter 11.

## Dementia and Nervous System Disease

As mentioned above, the central nervous system, along with other organs that have an elevated metabolic rate, such as the heart and kidneys, already have very high requirements for intracellular vitamin C to function normally. The added burden of increased bodywide oxidative stress and impaired cellular vitamin C delivery to all cells in the body makes these organs appear primarily targeted in DM compared to other diseases.

As discussed in Chapter 14, the energy metabolism of the brain in diseases such as schizophrenia and dementia is already substantially impaired by chronic inflammation, with decreased ATP production in the neurons. Nicotinamide adenine dinucleotide (NAD), while necessary for energy production in all the cells of the body, is especially important in maintaining sufficient energy production in the brain. The biosynthesis of NAD is strongly promoted by niacin (vitamin B3) and its vitamers, particularly niacinamide.[22] Keeping NAD levels high works to elevate the activity of the electron transport chain in the mitochondria, resulting in increased ATP formation.

As noted above, the increased IBO in any disease is substantially further exacerbated by the presence of a vitamin C-depleting disease, such as DM. This is reflected in the high incidence of dementia in DM patients as noted above.

The ability of niacin to support NAD levels and enhance mitochondrial ATP production is clear.[23] Because of this

improved energy production, supplementation with niacin has been linked to decreased all-cause mortality along with an anti-aging impact.[24-27]

The reversal and cure of advanced neurological diseases such as schizophrenia with niacin and vitamin C gives further support to the importance of quelling inflammation wherever it occurs if a positive clinical impact is to be realized.[28-32]

**As further evidence of this epigenetic defect, appropriate supplementation has been shown to partially restore the human liver's ability to synthesize vitamin C by helping to produce the missing enzyme (GULO).**

## Recap

Diabetes, dementia, and other diseases of the central nervous system all have advanced depletions of cellular vitamin C. The pathophysiology of DM results in less intracellular vitamin C than any other singular disease. And when DM coexists with another disease, the tissues involved in the other disease will be especially depleted of vitamin C, as those cells have an additional impaired uptake of vitamin C due to its direct competition with cellular glucose uptake.

Dementia and other nervous system disorders commonly coexist with DM. Neurological disorders are particularly susceptible to NAD deficiency, which plays a crucial role in producing sufficient ATP to support optimal brain function. As vitamin C is normally highly concentrated in neurons, the added vitamin C depletion seen in DM helps account for its common co-occurrence with nervous system disorders.

DM can readily be regarded as resulting from an epigenetic disorder in which the liver's ability to synthesize vitamin C from available glucose is absent. The glucose is not consumed to make new vitamin C, combined with the stress-induced formation of new glucose by cortisol-induced gluconeogenesis, chronically results in glucose excess that eventually manifests as DM in many people.

Refer to Chapter 20 for more details on treatment protocols for diabetes and dementia.

# Section Two

## The Disease Resolution Toolbox

Chapter 9

*The only thing more dangerous than ignorance is arrogance.*
Albert Einstein

# How Antioxidants Neutralize Oxidative Stress

## The Vital Role of Electron Flow

It has long been accepted that a reduced antioxidant, such as vitamin C (ascorbic acid or AA), readily donates its electrons to an oxidized biomolecule, thereby returning that biomolecule to a normally functioning state. It has long been assumed that the oxidized form of vitamin C (dehydroascorbic acid, or DHAA) is incapable of reducing oxidative stress, as it is already depleted of electrons.

However, DHAA and the oxidized forms of other antioxidants are ***just as effective*** as their reduced counterparts in decreasing oxidative stress throughout the body. This is because the therapeutic impact of a good antioxidant, such as vitamin C, is to continually distribute electrons from the existing electron supply, thereby creating an electron flow within cells. When in the reduced form, the antioxidant donates electrons to oxidized biomolecules. When in the oxidized form, the antioxidant collects new electrons

to donate to another oxidized biomolecule once again. While an antioxidant supplement in its reduced form does bring some "new" electrons into the body, the primary source of new electrons comes from the diet. DHAA is quickly converted into AA, the reduced form, as soon as it gets into the blood.

**The scientific literature establishes that the oxidized "electron-depleted" antioxidants are *just as effective clinically* as the reduced "electron-rich" forms.**

Here's an illustration of the importance of distribution: a company that manufactures widgets requires trucks to distribute them to its customers. Even when many widgets are being produced, few customers will receive them if there are only a few trucks available versus a large fleet waiting to deliver the product. In the body, electrons comprise the fuel that runs all cells. However, it is not enough to assimilate a large number of electrons from a well-balanced, quality diet. It is also essential that large amounts of vitamin C and other antioxidants are "ready and waiting" to grab those electrons (by reduction of the oxidized forms) and distribute them throughout the body. As discussed earlier, the reduced antioxidant quickly repairs the oxidized biomolecule, and the oxidized antioxidant awaits restoration to its reduced form by new, diet-derived, incoming electrons.

These redox biology principles can be summarized as follows:

- ✓ Optimal ***supply*** and ***distribution*** of electrons dictate a person's overall health.
- ✓ The new electrons that fuel the body come from the intake of nutritious foods (***supply***).
- ✓ The antioxidants in the body distribute electrons throughout the body and promote their optimal flow within cells (***distribution***).

- ✓ Reduced antioxidant supplements are ***not*** significant sources of ***new*** electrons.
- ✓ Both reduced and oxidized antioxidants exhibit an equal positive clinical impact, as both facilitate electron flow.

Notably, the literature suggests that administering vitamin C (AA) in its oxidized form (DHAA) may be more effective than administering it in its reduced form, at least for conditions affecting the brain and nervous system. DHAA easily crosses the blood-brain barrier, more so than AA. DHAA is the primary form of VC for supporting optimal levels of VC in the brain.[1] Once inside the nervous system cell, DHAA is rapidly restored to the reduced form of vitamin C by both enzymatic and non-enzymatic mechanisms.[2-3] These mechanisms work to help nervous system cells accumulate the highest levels of ascorbic acid in the body.[4] DHAA, along with vitamin D3, has been shown to lessen ischemic brain damage in rats.[5]

Currently, the clinical use of DHAA is largely negated by its expense, as well as the fact that it is not generally considered a beneficial form of vitamin C. It is primarily used for research applications and is not yet available as a marketed supplement. However, DHAA may prove to be an excellent way to routinely supplement vitamin C in the future if the bias against it disappears, and it becomes as affordable as most other supplements.

## BOMBSHELL DISCOVERY: Antioxidants Remain as Powerful After Oxidation

The scientific literature establishes that the oxidized "electron-depleted" antioxidants are ***just as effective clinically*** as the reduced "electron-rich" forms. In an animal study (mice), vitamin C administered in either its reduced form (AA) or its oxidized form (DHAA) was ***equally*** effective in reducing the

neurological damage and mortality when an occlusive stroke was created in the animals.[6] A similar study showed that DHAA effectively normalized multiple markers of oxidative stress and inflammation in rats with cerebral ischemia.[7] This indicates that the electron distribution capacity of the administered agent, rather than the supply of new electrons, is the key, as electron-depleted DHAA results in increased levels of electron-filled AA in the brains of test animals.[8-9] Because of these findings, the clinical equivalency of AA and DHAA has resulted in the reporting of vitamin C activity in the diet as the sum of both forms of vitamin C.[10]

**Another similar and impressive case report on a patient with otherwise refractory septic shock showed that MB had to be continually infused for a full 120 hours to overcome multiple dramatic clinical relapses when attempts were made to discontinue the MB infusion.**

More compelling evidence of the equal clinical value of administering an antioxidant in either its reduced or oxidized form comes from studies on methylene blue (MB). MB is a powerful antioxidant with a clinical impact comparable to that of vitamin C. When administered to patients, MB is most commonly found in its oxidized form. Nevertheless, in its reduced form, leucomethylene blue (LMB), it also has a powerful clinical impact, just like the comparable impact seen with either reduced or oxidized vitamin C. Furthermore, a combination of reduced and oxidized antioxidants has proven to be of great benefit in critically ill COVID-19 patients.[11]

Despite being in its oxidized form, studies have demonstrated that MB affords enormous benefit in patients with

all forms of advanced shock, including septic shock, its most consistently fatal form.[12-18] In one especially compelling case report, a 38-year-old man entered the hospital with bilateral bacterial pneumonia that quickly seeded itself into the bloodstream. Despite being given everything that modern medicine has to offer, including antibiotics, IV fluids, and even insulin, his blood oxygen levels continued to drop as he struggled to breathe, and he was intubated and received respiratory support on a mechanical ventilator. Hypotension requiring the support of vasopressor agents ensued. A broader range of antibiotics was given, yet metabolic acidosis with declining kidney function followed, and cardiac arrest finally occurred a few hours later. Upon resuscitation, ECMO (extracorporeal membrane oxygenation) was then initiated to support the patient's vital functions. However, multiple vasopressors failed to prevent or reverse the continued hypotension, acidosis, and hypoxia.

MB was then administered as a large IV bolus followed by an infusion of MB over the next 10 hours. The blood pressure promptly responded, and vasopressor support could be decreased. The MB infusion was continued for 54 hours, and the patient made a full recovery. He was discharged from the hospital seven days after the infusion was completed.[19] Another similar and impressive case report on a patient with otherwise refractory septic shock showed that MB had to be continually infused for a full 120 hours to overcome multiple dramatic clinical relapses when attempts were made to discontinue the MB infusion. Following this lengthy infusion, however, the patient stabilized and was eventually discharged.[20]

Septic shock has also been consistently resolved with a reduced vitamin C-based treatment protocol.[21] Another comparable treatment protocol using ***only*** reduced vitamin C achieved similar results in achieving a striking decrease in the mortality of patients dying of septic shock.[22] Reduced vitamin C has long

been documented to resolve a vast array of infections and infectious diseases.[23] There have never been any trials of infusing DHAA into patients rather than AA, as it has always been assumed to be "obviously" ineffective and possibly harmful.

> **The conclusion is clear, then, that *reduced* vitamin C (AA) and *oxidized* methylene blue (MB) are *both* highly effective treatments for resolving the advanced oxidative stress observed in numerous conditions, particularly in the life-threatening condition of septic shock. Traditional redox physiology incorrectly asserts that the oxidized forms of either vitamin C or MB should be clinically ineffective at best and potentially toxic.**

Furthermore, some confusion as to the "toxicity" of DHAA and other oxidized antioxidants comes from a few studies that have documented that elevated blood levels of DHAA are routinely seen with advanced bodywide oxidative stress, as is seen with significant infections and some chronic diseases.[24-26] However, this finding does not mean that DHAA is toxic or causes increased oxidative stress. Instead, it is a direct ***marker*** of the significant depletion of available electrons in the body that can be effectively distributed by vitamin C and the body's antioxidant matrix. In other words, an adequate "pool" of electrons is no longer available in such patients to reduce all the DHAA to AA, and the DHAA will then increase relative to AA in the blood.

Because of this assumption that oxidized antioxidants are spent and even possibly toxic, virtually all antioxidant supplements are marketed in the reduced form; however, there are significant "exceptions" to this marketing of antioxidants. Coenzyme Q10, another antioxidant that is an essential component of the electron transport chain in mitochondria needed to synthesize optimal amounts of ATP (adenosine triphosphate),

is sold in both its reduced (ubiquinol) and its oxidized (ubiquinone) forms.[27] Ironically, one study even concluded that the oxidized form of Coenzyme Q10 was superior in its cardioprotective effects than the reduced form.[28] Both forms are protective, as the intravenous administration of oxidized or reduced CoQ10 rapidly increases their concentrations in the tissues and provides protection against ischemic damage, as occurs in the loss of blood supply to the heart.[29]

**Ironically, one study even concluded that the oxidized form of Coenzyme Q10 was superior in its cardioprotective effects than the reduced form.**

Vitamin K2 is another supplement that is administered in its oxidized form rather than its reduced form. Vitamin K2 is a menaquinone that is reduced to menaquinol. Like the other examples noted above, both the oxidized and the reduced forms of vitamin K2 effectively reduce oxidative stress in many tissues and organs.[30-32]

## The Source of All New Electrons

All "new" electrons coming into the body come from the solar irradiation of plants and flora. Photosynthesis transforms plant leaves and stems into manufacturing and storage sites for a wide variety of antioxidant (nutrient) substances, which are all rich in electrons. Even for the meat-eater, the new electrons being assimilated into the body ultimately came from the sun and the plant life being consumed by the animal. Technically, new electrons can also enter the body from exposure to magnetic fields of the correct orientation, exposure to very low levels of direct electrical current, and even from increased contact with the earth (grounding).

Typing "leaf extract" into the search box on the PubMed website produced over 6,000 hits three years ago and now produces over 9,000 hits. A glance at the abstracts reveals that nearly all the numerous plants addressed had components with multiple positive clinical effects, including anti-cancer, anti-inflammatory, immune-stimulating, antitoxin, antioxidant, anti-hyperglycemic, and anti-pathogen properties. With relatively rare exceptions, all plants and stems have a profoundly beneficial impact on health because they contain vast numbers of molecules with a high electron content. Some plants produce significant toxins, but not many. Here are a few good examples of the positive impacts of different leaf extracts:

- ✓ Artichoke plant (*Cynara cardunculus*) leaf extract (LE): prevents alcohol-induced acute gastritis and increases gastric mucus content[33]
- ✓ Bangkal tree (*Nauclea subdita*) LE: anti-inflammatory and immune-stimulating effects in catfish[34]
- ✓ Bay leaf plant (*Syzygium polyanthum*) LE: significant anti-inflammatory effects in a rat model of myocardial infarction[35]
- ✓ Jamaica cherry tree (*Muntingia calabura*) LE: significant inhibition of *Pseudomonas aeruginosa* virulence and biofilm formation[36]
- ✓ Kenidai shrub (*Bridelia tomentosa*) LE: protection against toxin-induced liver damage in rats[37]
- ✓ Kohila plant (*Lasia spinosa*) LE: anti-inflammatory in vitro in macrophages; effective against all the life cycles of trichinellosis[38-39]
- ✓ Tewa plant (*Cratoxy formosum*) LE: inhibits proliferation and migration of breast cancer cells in vitro[40]

- ✓ Turkey berry plant (*Solanum torvum*) LE: potent antibacterial activity against methicillin-resistant staphylococci[41]
- ✓ Walnut tree (*Juglans regia*) LE: improves testicular dysfunction in diabetic rats[42]
- ✓ Watermelon plant (*Citrullus lanatus*) LE: lessens biochemical abnormalities in diabetic rats[43]
- ✓ White ribbon bush (*Hypoestes forskahlii*) LE: antidiabetic and antihyperlipidemic effects in mice[44]
- ✓ Wild tea plant (*Osyris quadripartita*) LE: antidiarrheal activity in mouse models[45]
- ✓ Wild pear tree *(Pyrus biossieriana*) LE: antioxidant, antihyperglycemic, and antihyperlipidemic agent in rats[46]

This is a small sampling from the 67 leaf extract articles found in the ***first 200*** of the abstracts reviewed. Do an in-depth study on any plant stem or leaf, and "new" antioxidants carrying the energy of the sun as stored electrons will ***always*** be found. All beneficial clinical agents will consistently ***deliver*** an electron-rich, antioxidant impact in the form of new, unoxidized nutrients.

## ORAC—A Misleading Test

The ORAC (oxygen radical absorption capacity) test is considered by many to be the most critical measure of the "power" of an antioxidant.[47-49] However, many antioxidants have higher "scores" than vitamin C or vitamin C-containing foods despite the superior clinical impact of vitamin C on patients. This is because the ORAC test only measures how readily electrons are donated to oxidized molecules. The test does not address how readily electrons move back and forth between the reduced and oxidized forms of the antioxidants. And even more importantly, the ORAC test does not account

for how readily the measured antioxidant is distributed throughout the body or how well it optimizes the flow of electrons in all tissues.

Companies that sell antioxidant supplements often use ORAC test measurements to say their supplement is many times more "powerful" than vitamin C, indicating their veiled respect for vitamin C as the superior antioxidant in the body. A fat-soluble antioxidant that is especially beneficial for protecting the eye is astaxanthin. Supposedly, by ORAC values, astaxanthin is an antioxidant that is 6,000 times stronger than vitamin C. However, if you never supplement or eat foods rich in astaxanthin, you do not get sick and die of an astaxanthin-deficiency syndrome. On the other hand, if you severely limit your intake of vitamin C, you will end up dying a truly miserable death in a state of advanced scurvy.

This is because the primary value of an antioxidant depends on how well it can access all the vital organs and tissues in the body. Astaxanthin is a large, fat-soluble molecule that is very limited in the tissues it can reach and in which it can accumulate. Vitamin C, however, is designed by nature to reach wherever antioxidant impact is needed. Vitamin C is a uniquely powerful and effective antioxidant in terms of clinical impact because it:

- ✓ Is a small molecule that is present in all the cells
- ✓ Uses the existing passive glucose transporters in the cell membrane to enter the cells competitively with glucose
- ✓ Also uses specific active transporters in the cell membrane to enter the cells
- ✓ Has easy access to the intracellular organelles once it is inside the cells

- ✓ Can relay or shuttle two electrons per molecule rather than one
- ✓ Has a relatively stable one-electron-depleted intermediate state (ascorbyl radical), allowing it to be optimally responsive to the immediate reduction or oxidation needs of the microenvironment and effectively serving as an electron buffer in the plasma[50-52]
- ✓ It is clinically the most critical antioxidant, as its significant deficiency results in death.

## Recap

Redox (reduction-oxidation) chemistry involves the continual shuttling of electrons between antioxidants in their reduced and oxidized forms in the body. Toxins are always electron-depleted, and they do their damage by stripping active biomolecules of their electrons and rendering them inactive. Most importantly, toxins never put these electrons back into circulation and serve only to deplete the size of the life-giving electron pool in the body.

Like a toxin, an oxidized antioxidant is also electron-depleted, but only briefly in a cell with normal metabolism, as reduced and oxidized antioxidants continually shuttle their electrons back and forth, giving rise to health-sustaining microcurrents inside the cells. Yet, it has been commonly believed that an electron-depleted antioxidant (such as oxidized vitamin C or DHAA) is toxic because it is depleted of electrons, much like a toxin. However, a review of the pertinent scientific literature clearly shows that antioxidants administered in either their reduced or oxidized form are ***equally*** beneficial clinically. This means that the purpose of a quality antioxidant in the body is to optimally distribute the

electrons already present in the body, rather than to introduce new electrons into the body. New electrons come into the body from the diet. In a nutshell, then,

> **Antioxidants have equally positive clinical impact whether administered in their reduced or oxidized states, or a mixture of both. Oxidized antioxidants are *not* toxic.**

## Chapter 10

*Just because you believe in something does not mean that it is true.*
Albert Einstein

# Important Modulators of Oxidative Stress

## Major Players Determining Intracellular Oxidative Stress

The primary characteristic of any disease, infection, or intoxication at the cellular level is increased intracellular biomolecule oxidation (IBO). If IBO is not elevated, there is no disease or pathology, and the cell is physiologically normal (see Chapter 1). The primary players inside the cell that interact to determine the oxidative status of the cell are the intracellular levels of:

- ✓ Calcium
- ✓ Magnesium
- ✓ Vitamin C
- ✓ Glutathione
- ✓ Adenosine triphosphate (ATP)

The critical impact of several hormones on these intracellular factors will also be examined. It will become apparent that

the optimal functioning of cells throughout the body requires ensuring that all these factors interact optimally to achieve and maintain a healthy cellular status.

Because of this, understanding what positively (or negatively) impacts these factors is essential to not only understanding clinical illness but also to understanding what measures are best suited to normalizing these levels.

## Intracellular Calcium

The intracellular calcium concentration is the primary determinant and marker of increased intracellular biomolecule oxidation (IBO). The higher the cytoplasmic calcium level, the greater the IBO and the more that biomolecules inside the cell are in the oxidized state relative to being in the reduced state. When the IBO gets high enough, cell death by necrotic rupture or programmed cell death takes place. The highest degrees of IBO short of cell death are seen in actively metastatic and spreading cancer cells. However, when the IBO can be lowered to physiological or normal levels, the cell returns to a normal state. This means that:

> **The lowering of intracellular calcium levels is the *most straightforward way* to lower and normalize IBO, which effectively treats all disease processes and medical conditions.**

As discussed in Chapter 3, increased calcium intake from both supplemental and dietary sources is associated with a dramatic increase in all-cause mortality (death from any cause).[1] Studies show that calcium supplementation alone significantly increases the risk of heart attack and cardiac death.[2-3]

## Intracellular Magnesium

Quite simply, when intracellular calcium levels are high, magnesium levels inside the cells are low, and vice versa. There is always a reciprocal relationship between calcium and magnesium inside the cells. As more magnesium goes into the cell, calcium levels decrease. Magnesium is a natural calcium channel blocker, and it is the primary agent needed to maintain normal or nearly normal cellular calcium levels. (See Chapter 13). Since excess calcium inside the cells is the primary determinant of how sick a cell is and how elevated the oxidative stress is, magnesium is the singularly most critical nutrient/electrolyte. Due to this crucial reality, the body must constantly receive magnesium through magnesium-rich foods and robust supplementation. ***Nothing*** functions normally in the body when cellular calcium levels are high and cellular magnesium levels are low. And the more abnormal these levels are, the more abnormal the affected cells are, and the worse the clinical disease that results from them. Just as extra calcium increases all-cause mortality, more magnesium decreases all-cause mortality.[4-5]

**_Nothing_ functions normally in the body when cellular calcium levels are high and cellular magnesium levels are low.**

## Intracellular Vitamin C

When intracellular calcium levels are high and intracellular magnesium levels are low, vitamin C levels are consistently low as well. When more vitamin C can be delivered inside the cells, IBO is further decreased, and more magnesium can have an even greater effect in normalizing elevated cellular calcium levels. Glutathione

is an intracellular antioxidant that is necessary to maintain IBO levels at a physiological level (but not excessive), thereby keeping cellular health optimal. The interplay between ATP production and normal GSH synthesis is ongoing and dynamic. If one of these is impaired, then the other is also impaired. ATP is needed for GSH synthesis, with two molecules of ATP required to synthesize one molecule of GSH![20]

Just as sufficient ATP production is required for numerous metabolic reactions to occur, GSH is also necessary, as the neutralization of toxins that form or enter the cells requires optimal levels of reduced GSH. The more intracellular toxins are neutralized, the easier it is for cells to maintain the oxidative health necessary to support ongoing ATP production in the mitochondria. None of the positive factors that support the minimization of oxidative stress inside the cells operates independently. One supports the other, and when one is severely impaired, the negative impacts are also amplified.[21-22]

## Intracellular Glutathione (GSH)

Glutathione is the most concentrated of the intracellular antioxidants under normal circumstances. However, protective reduced GSH levels will never be normal when magnesium and vitamin C levels are depressed, and calcium levels are elevated. The synthesis and maintenance of normal levels of GSH, along with the support of normal GSH detoxification metabolism, can only occur as the levels of these other three agents normalize. Increased IBO results in more GSH-related enzymes being oxidized and inactivated. Supplementing GSH or its precursors is beneficial, but it will never be optimally effective until advanced degrees of increased IBO have been alleviated, so that the oxidized GSH-synthesizing enzymes can be reactivated

(reduced) and start to contribute to the overall normalization of GSH levels and IBO.[6-9]

## Intracellular Adenosine Triphosphate (ATP)

ATP, discovered in 1929, is recognized as the molecule most responsible for fueling numerous metabolic reactions that require a direct source of energy to proceed. It is regarded as the energy exchange factor that connects anabolism (tissue synthesis) and catabolism (tissue breakdown) in the body.[10] More simply: low ATP means low energy and compromised metabolism everywhere. And high ATP means high energy and optimal metabolism everywhere.

Most of the ATP in the body is formed within the mitochondria inside the cells. Elevation of intracellular calcium, noted above as the primary factor resulting in increased IBO, directly impairs the synthesis of new ATP.[11-13] Magnesium has been shown to protect against the toxic impact of calcium on mitochondrial function.[14]

**The lowering of intracellular calcium levels is the *most straightforward way* to lower and normalize IBO, which effectively treats all disease processes and medical conditions.**

Not surprisingly, factors that decrease IBO (antioxidants) directly lower the oxidative stress inside the mitochondria and support improved ATP synthesis. In a study on rats subjected to the stress of low oxygen levels (hypoxia), the administration of vitamin C resulted in a prompt increase in ATP stores, protecting against subsequent tissue damage.[15] Another animal

study demonstrated that vitamin C had a neuroprotective effect after optic nerve damage, which was related to increased ATP production.[16]

Magnesium, which is most concentrated inside the mitochondria, is also vital to the maintenance of normal ATP synthesis. ATP synthase is the terminal enzyme that results in the synthesis of new ATP from adenosine diphosphate (ADP). ATP is formed when an additional phosphate (PO4) is added to ADP, which must be complexed with magnesium for ATP synthase to proceed. The importance of magnesium in the ongoing maintenance of normal ATP levels is further underscored by the fact that its concentration inside the mitochondrial matrix is tenfold higher than in the cytoplasm.[17-19]

Glutathione is an intracellular antioxidant that is necessary to maintain IBO levels at a physiological level (but not excessive), thereby keeping cellular health optimal. The interplay between ATP production and normal GSH synthesis is ongoing and dynamic. If one of these is impaired, then the other is also impaired. ATP is needed for GSH synthesis, with two molecules of ATP required to synthesize one molecule of GSH![20]

Just as sufficient ATP production is required for numerous metabolic reactions to occur, GSH is also necessary, as the neutralization of toxins that form or enter the cells requires optimal levels of reduced GSH. The more intracellular toxins are neutralized, the easier it is for cells to maintain the oxidative health necessary to support ongoing ATP production in the mitochondria. None of the positive factors that support the minimization of oxidative stress inside the cells operates independently. One supports the other, and when one is severely impaired, the negative impacts are also amplified.[21-22]

## Critical Hormone Impact on Cellular Oxidative Status

The body contains many different hormones, and optimal health requires the presence of all of them functioning properly in the body, both within the intracellular and extracellular spaces. Conceptually, all hormones have two primary purposes:

- ✓ To positively modulate some aspect(s) of biochemical metabolism (optimizing and accelerating specific metabolic pathways)
- ✓ To minimize or normalize the production of excess oxidative stress (to achieve normal IBO levels inside the cells)

Although different hormones have widely varying specific biochemical and metabolic impacts, they all share these two primary purposes. Four of the most essential hormones in the body have direct and indirect effects on the five agents noted above, and all work to minimize bodywide oxidative stress. These are:

- ✓ Sex hormone (testosterone or estrogen)
- ✓ Thyroid hormone
- ✓ Cortisol (hydrocortisone)
- ✓ Insulin

### Sex hormones—Estrogen

Estrogen exhibits calcium channel-blocking effects and calcium antagonist properties, which contribute to its significant anti-inflammatory properties, occurring as depressed intracellular vitamin C and GSH levels normalize.[23-25] It has been shown to decrease cardiovascular and all-cause mortality. Women who reach menopause earlier in life and have fewer cumulative years of normal estrogen presence have increased cardiovascular disease events.[26-27]

Estrogen also helps conserve magnesium in the body by promoting its retention through tubular reabsorption in the kidneys.[28-29] It has also been shown to utilize glutathione to exert a neuroprotective effect in such diseases as Alzheimer's.[30-31] Estrogen replacement therapy has been shown to be important in the restoration of normal GSH levels, along with the increased expression of multiple antioxidant and longevity-related genes in women. In an animal study, estrogen also functioned to increase protective GSH levels in brain cells after induced stroke injury.[32]

While the restoration of estrogen levels in postmenopausal women has been clearly shown to be beneficial, there are different ways that estrogen can be given. Not all estrogen-replacement protocols are equally effective in reducing oxidative stress throughout the body. Different regimens appear to have more significant side effects than others.[33] Transdermal applications of estrogen have been found to diminish and even eliminate side effects seen with other forms of hormone application.[34]

**Magnesium, which is most concentrated inside the mitochondria, is also vital to the maintenance of normal ATP synthesis.**

Another vital interaction involves estrogen with vitamin C. Since all harm at the cellular level stems from increased IBO or generalized oxidative stress, increasing antioxidant intake can consistently allow for optimal hormone impact while eliminating or minimizing potential side effects. Vitamin C works very well to prevent estrogen-induced mammary tumors in rats.[35] It also improves endothelial function in estrogen-deficient women.[36] While vitamin C should be taken regularly by everyone for good health anyway, women taking any hormone replacement regimen should especially be on at least several

grams of vitamin C daily. Vitamin C, when combined with vitamin E, has been shown to reduce the increased oxidative stress associated with the use of oral contraceptives.[37]

Estrogen also plays a vital role in glucose metabolism and the effects of insulin. Estrogen improves insulin sensitivity (or reduces insulin resistance). It helps decrease the chances of developing diabetes mellitus, as well as metabolic syndrome, which reflects a more generalized dysfunction in carbohydrate metabolism.[38] This protective effect of estrogen in this regard tends to disappear with menopause but can be regained with appropriate hormone replacement therapy.[39]

Estrogen is also a significant contributor to the enhancement of mitochondrial respiration and ATP production. The decline in estrogen levels in postmenopausal females appears to play a significant role in facilitating neuronal degeneration and the evolution of such diseases as Alzheimer's.[40-44]

Estrogen has a direct impact on all five of the major metabolic players noted above, which affect IBO and generalized oxidative stress. When estrogen levels are substantially low on a chronic basis, maintaining optimal levels of these important agents is impossible.

## Sex hormones—Testosterone

The positive impact of normal testosterone levels in men on the levels of the five major players regulating oxidative stress is quite comparable to the effects of normal estrogen levels in women on those levels.

Testosterone has calcium channel blocker properties, which work to lower elevated intracellular calcium levels and the increased IBO associated with that elevated calcium.[45-47] Low testosterone levels and very low estrogen levels in men are associated with increased all-cause and cardiovascular mortality.[48-52]

Similar to the impact of estrogen on women, testosterone has an anti-inflammatory effect, suppressing oxidative stress.[53]

Low testosterone levels in men also have a similar impact on carbohydrate metabolism and impaired energy metabolism (generation of ATP) as low estrogen levels have in women.[54-57] Testosterone also has a significant relationship with magnesium, as magnesium supplementation has been shown to increase testosterone levels.[58-59] Low testosterone levels also predispose individuals to insulin resistance, which can be significantly reduced by robust magnesium supplementation.[60-61] Whenever insulin resistance is present, pursuing vigorous magnesium supplementation should be one of the first steps, along with testosterone therapy if those levels are low.[62-64]

## Thyroid hormone

While all hormone deficiencies and excesses have bodywide negative impacts, there is no hormone more critical in the optimal functioning of every cell in the body than thyroid hormone. With thyroid hormone, increased hormone levels can be just as damaging as decreased hormone levels.[65] While all hormones are optimally beneficial when in the proper balance, even minor deficiencies or excesses of thyroid hormone must not remain undetected and unaddressed for too long a time.

Minimally deficient thyroid function ("subclinical hypothyroidism") is widespread but typically remains undiagnosed when traditional thyroid function tests are the only ones measured. Nevertheless, minimal hypothyroidism substantially increases bodywide oxidative stress, even when the usual thyroid function tests fall within the reference or normal range. The physiological effects of subclinical hypothyroidism result in a lowered defense against the contraction of infectious diseases, as well as an increased chance of the metastatic-like spread of some focal

infections. Similarly, subclinical hypothyroidism is a factor that also promotes the metastatic spread of cancers.

Thyroid hormone has been shown to have a significant impact on intracellular calcium and magnesium levels, which are primary determinants of the cell's oxidative status. In hypothyroid rats, the calcium content of the heart is elevated.[66] In another rat model, thyroid hormone was shown to prevent calcium overload in the heart by actively pushing it out of the cells being studied (extrusion mechanisms).[67] When thyroid hormone levels are optimized, intracellular calcium levels can then achieve or approach normalization.

The impact of thyroid hormone on intracellular magnesium levels is the opposite of its effect on intracellular calcium levels. In hypothyroid animals, thyroid supplementation alone worked to restore previously depleted magnesium levels.[68] In diabetic rats, impaired thyroid parameters were partially restored with magnesium administration.[69] Lowered blood magnesium levels were observed in patients following thyroidectomy.[70] Severely low blood magnesium levels were seen in patients with hypothyroidism and Hashimoto's thyroiditis.[71]

Thyroid hormone also directly stimulates mitochondrial respiration and the synthesis of ATP. Less ATP is generated in the hypothyroid state, and too much ATP is consumed in the hyperthyroid state. Thyroid hormone balance is crucial for maintaining optimal levels of ATP in the mitochondria.[72-73]

## Cortisol (Hydrocortisone)

Cortisol is the naturally occurring corticosteroid hormone secreted by the adrenal glands in response to a significant new oxidative stress appearing in the bloodstream. Cortisol is prescribed as hydrocortisone, but it is chemically identical to cortisol.

Commonly known as the "anti-stress" hormone, the primary functions of this hormone are designed to neutralize the new toxins that appear when an infection is taking hold or when a new toxin unrelated to an infection appears in the blood.

Vitamin C is the agent naturally used by the body to quell areas of inflammation, which are always sites of severe vitamin C depletion. When vitamin C levels are completely restored at an inflamed site, no inflammation any longer exists. Vitamin C, then, is the ***one actual anti-inflammatory agent***.

**Vitamin C is the real "anti-stress hormone," not cortisol or other corticosteroids.**

Any agent that effectively alleviates inflammation does so only because it helps restore depleted vitamin C levels in areas of inflammation, or because it eliminates the toxin or infection-related toxin(s) that continuously consume the vitamin C in the inflamed tissue.

**There can be NO alleviation of the inflammation in affected tissues unless depleted vitamin C levels in those tissues are restored.**

Whenever cortisol levels are elevated, the first etiology that must be considered is the presence of a substantial depletion of vitamin C levels throughout the body. When bodywide oxidative stress is most pronounced, such as in septic shock, the adrenal glands produce as much cortisol as possible in an attempt to increase the vitamin C content within the cells.[74] Vitamin C has consistently resolved septic shock when dosed adequately ***without*** the addition of extra cortisol, since the internal cortisol production is already significantly elevated.[75-76]

Of course, without the addition of vitamin C to the treatment regimen, the cells will never return to a normal oxidative status. A comparable example of increased cortisol production is

observed following burn injuries, where oxidized, burned tissues require vitamin C to heal optimally. However, only cortisol, without added vitamin C, is what the body generally provides to the burned areas.[77-78]

Both naturally occurring cortisol and synthetic corticosteroids are **regarded** as powerful anti-inflammatory agents. Although the administration of such agents can result in the resolution of inflammation, they are not ***inherently*** anti-inflammatory on their own. Instead, when cortisol binds to its intracellular receptors, the uptake of vitamin C into the cells is greatly enhanced as more vitamin C cell membrane transporters are produced.[79]

Synthetic corticosteroids have also been shown to increase cellular vitamin C uptake in mouse cells.[80] Under the circumstances of significantly increased oxidative stress in the blood, the release of natural cortisol quickly transfers the available extracellular vitamin C into the cells. And when vitamin C is administered at the same time, the anti-inflammatory effect is further enhanced and substantial, as even more vitamin C is available to be ushered into the cells by the cortisol. This is also why steroid therapy becomes less effective over time unless significant vitamin C supplementation is taken to maintain extracellular vitamin C levels that allow cortisol to transport it into the cells.

**...cortisol cannot directly reduce oxidative stress without delivering more vitamin C intracellularly, where inflammation is most pronounced.**

Cortisol levels can become chronically elevated when little vitamin C is ingested and when substantial chronic oxidative stress throughout the body remains unresolved. More cortisol continues to be released by the adrenal glands in the "hope" that it will quench the increased oxidative

stress. However, without the regular intake of vitamin C, this will never occur, as cortisol cannot directly reduce oxidative stress without delivering more vitamin C intracellularly, where inflammation is most pronounced. This is a significant reason for the chronically elevated cortisol levels seen in many patients with different diseases.

> **Although the studies have not yet been done, it is highly likely that generous multigram supplementation of vitamin C in all patients with chronically elevated cortisol levels, including those with Cushing's syndrome, would lower and often normalize cortisol levels.**

Magnesium supplementation, which helps resolve IBO and persistently low intracellular levels of vitamin C, has been shown to decrease cortisol release.[81-83] This is another indication that cortisol is primarily needed to facilitate the uptake of vitamin C into cells and lower IBO, as lowering the oxidative status within cells reduces the amount of cortisol necessary to maintain healthy cellular levels of vitamin C.

Hydrocortisone is also another calcium channel blocker that works to decrease intracellular calcium levels, which is another factor that lessens IBO independent of its ability to increase cytoplasmic vitamin C levels.[84-85]

## Insulin

Insulin is one of the most powerful healing agents in existence, yet it remains highly underutilized for its therapeutic effects. In both humans and animals, many studies have now established that insulin dramatically enhances and accelerates wound healing. This applies to both diabetic and non-diabetic subjects, as well as to both topical and systemic applications of insulin.[86-96]

Although few, if any, wound care centers around the world utilize insulin to enhance healing, the literature makes it clear that not using it should be considered medical malpractice.

Optimal healing is observed when the affected cells in an infection, intoxication, or other disease process can normalize their intracellular levels of calcium, magnesium, vitamin C, glutathione, and ATP. ***Insulin positively impacts all these levels***. Insulin stimulates magnesium uptake, which helps to lower calcium levels.[97] Insulin also works to conserve magnesium in the body by stimulating its reabsorption in the kidneys before it is excreted in the urine.[98] Insulin resistance is also directly related to decreased cellular magnesium, and vigorous magnesium supplementation should always be initiated as part of any treatment protocol for insulin resistance.[99-103]

Insulin also directly promotes the uptake of vitamin C into cells via the same cell membrane transporters that facilitate the entry of glucose into the cell. It works by releasing these transporters from cellular storage sites, thereby increasing their expression on the cell membrane. Vitamin C and glucose are in direct competition for this transport. The more that one goes in, the less of the other, although there are other transporters more specific for vitamin C.[104-108]

Insulin has been documented to increase glutathione levels.[109-111] It has also been noted to improve mitochondrial function and stimulate ATP synthesis.[112-114]

## Recap

Regardless of the condition, toxin, or infection, affected cells can only recover and return to a state of normalcy when elevated intracellular levels of oxidation (as oxidized biomolecules) are returned to normal, physiological levels. This is always accomplished when cellular levels of calcium, magnesium, vitamin C,

glutathione, and ATP are restored to their optimal ranges. While multiple interacting factors are always at play in cellular physiology, sex hormones, thyroid hormone, cortisol, and insulin play critical roles in maintaining and restoring intracellular health.

Many of the direct and indirect relationships among these nine factors are discussed. None of these interactions occurs in isolation, and attention should be made to address as many of them as possible. Hormone deficiencies should always be restored to as normal a status as possible, in addition to correcting the levels of the five intracellular metabolic agents mentioned as directly as possible.

Healthy cells and optimal healing from injury both require increased intracellular oxidation levels to be optimally restored to normal and maintained. When this occurs, the intoxication, infection, or medical condition is resolved. And improvement can be achieved to the degree that oxidative normalcy is approached.

Many factors contribute to regulating oxidative stress and maintaining redox balance in the body. The factors discussed in this chapter are among the most important and should be addressed as directly as possible in a clinical treatment protocol.

## Chapter 11

*An expert is a person who has made all the mistakes that can be made in a very narrow field.*

Niels Bohr

# Optimizing the Immune System

## The One Function of the Immune System

A strong immune system is crucial for achieving and maintaining optimal health. In contrast, an immune system compromised by toxins, infections, and other sources of excessive oxidative stress fuels countless diseases and medical conditions. While the literature on immune function is enormous and complex, an underlying simplicity exists in achieving a state of strong immune function.

> **The immune system has only ONE purpose: to restore inflamed tissue to a normal status.**

The cells in any inflamed tissue are always characterized by excess IBO (intracellular biomolecule oxidation). Excess IBO is the common denominator in ***all*** diseases and medical conditions. As long as excess IBO is present in the tissue, a diseased state will persist, and the immune system will remain chronically activated in

an attempt to normalize the oxidative stress both inside and outside the cells.

> **While the medical and scientific literature contains numerous articles on various aspects of the immune system, the immune response serves *only one primary function*: to concentrate in areas or tissues of the body that are inflamed and to quell and reverse the inflammation until the tissue returns to a normal, uninflamed state.**

## Understanding and Reducing Inflammation

Inflammation is currently viewed in the literature as the primary abnormality in diseased organs or tissues. Similarly, increased oxidative stress or excess IBO is always part of the pathology in any disease. However, despite these observations, the real reason for the presence (and persistence) of inflammation has remained unappreciated.

Inflammation ***only*** occurs when a condition of significant vitamin C deficiency exists in the affected tissues. Conversely, when vitamin C becomes severely depleted in an affected tissue, that tissue can be regarded as being inflamed. In other words, focal inflammation is just another way of referring to focal scurvy (the severe depletion of vitamin C). And finally, when this state of vitamin C depletion is present, then ***increased oxidative stress*** is always present as well. This means that:

> **Inflamed tissue = tissue depleted of reduced vitamin C = tissue with increased oxidative stress (or increased IBO).**
> ***The severity of vitamin C depletion determines the***

***severity of the inflammation and the degree of elevation of the oxidative stress.***

And when the vitamin C depletion cannot be restored, then the acute inflammation evolves into chronic inflammation, and the initial acute immune response to the inflammation becomes a chronic immune response.

**Since vitamin C depletion remains unrecognized as the cause of inflammation, many alternative yet flawed reasons for the chronicity of inflammation continue to be proposed.**[1]

## Vitamin C and Cortisol: Synergistic Partners

Any substance that has anti-inflammatory properties also has antioxidant properties. As all redox reactions inside the cells depend on the continued exchange, or "flow," of electrons between biomolecules, an agent that optimally and efficiently restores a normal electron status to oxidized biomolecules will always work to decrease the inflammation in those affected cells.

Vitamin C is the most critical anti-inflammatory substance in existence. All diseases are associated with increased IBO, and ***all true anti-inflammatory agents are antioxidants***. However, nearly all the antioxidants in the body serve to support optimal levels of reduced vitamin C within cells, as the unique properties of vitamin C (see Chapter 12) make it the ideal antioxidant for reducing oxidative stress throughout the body, including the extracellular spaces. Other antioxidants can ***contribute*** to the anti-inflammatory impact of vitamin C, but none can equal

**The immune system has only ONE purpose: to restore inflamed tissue to a normal status.**

or replace its impact. This is why too little vitamin C results in an inevitably fatal deficiency condition (scurvy). In contrast, no other vitamin, mineral, or nutrient/antioxidant deficiency has as comparably powerful a negative impact on overall health and survival.

**The synergistic relationship between vitamin C and cortisol suggests that they are *designed by nature* to interact together in stopping and reversing the increased oxidation seen in all diseased and inflamed tissues.**

Cortisol (hydrocortisone), the natural corticosteroid released from the adrenal glands in increased amounts at times of increased oxidative stress (new infection and/or toxin presence in the blood), serves one primary role: ***to enhance the cellular uptake of vitamin C throughout the body***. Because of this ability, cortisol and its related synthetic agents (prednisone, dexamethasone, methylprednisolone, etc.) are regarded as potent anti-inflammatory agents.

However, naturally produced cortisol and synthetic prescription corticosteroids have NO significant natural intrinsic anti-inflammatory properties. They primarily work to optimize cellular uptake of vitamin C, the actual natural and optimal anti-inflammatory agent, which gives them their reputation as potent anti-inflammatory agents.

Cortisol does have some calcium channel blocking ability, which would also lead directly to a lowering of oxidative stress inside cells that would manifest as an anti-inflammatory effect.[2-4] This effect can augment the anti-inflammatory impact of increased intracellular vitamin C levels. Even so, traditional and powerful calcium channel blockers are not widely recognized as potent anti-inflammatory agents, although the literature suggests that they do have some anti-inflammatory effects.[5-6]

The synergistic relationship between vitamin C and cortisol suggests that they are ***designed by nature*** to interact together in stopping and reversing the increased oxidation seen in all diseased and inflamed tissues. The nature of this relationship is highlighted by the fact that the normal reaction of the body to significant new inflammation and/or infection is to release cortisol from the adrenal glands, allowing it to interact with a concurrent release of new vitamin C from the liver that ***should*** occur at the same time. However, most humans have an epigenetic defect, lacking the L-gulonolactone oxidase (GULO) enzyme in their liver, which is needed to complete the conversion of glucose to vitamin C. Nevertheless, this interrelationship between vitamin C and cortisol directly indicates that the most effective way to ensure optimal uptake of vitamin C into the body's cells is to administer it in conjunction with hydrocortisone.

**As inflammation in a tissue is essentially a label given to any tissue with significantly depleted vitamin C, the ultimate goal of any treatment protocol is always to improve, and ideally to normalize cellular vitamin C levels as wholly and promptly as possible.**

Cortisol significantly augments the uptake of vitamin C into cells. This was demonstrated in monocytes from individuals given vitamin C with and without the administration of intravenous hydrocortisone.[7-8] Specifically, it stimulates the production of the messenger RNA needed to increase the expression of the sodium-dependent vitamin C transporters (SVCTs) in the cell membranes. These membrane transporters directly enhance cellular vitamin C uptake, which is essential for maximizing the protection of metabolically active cells against oxidative stress.[9]

**Restoring and maintaining normal intracellular vitamin C levels is the primary role of cortisol in the body. Tissue inflammation, the pathology present in**

**any disease or medical condition, will never resolve until normal intracellular vitamin C levels have been restored.**

## The Acute Immune Response

Focal vitamin C depletion in a tissue is the primary identifying feature of focal inflammation. Greater degrees of focal inflammation only occur with greater degrees of focal oxidative stress and lower cellular and extracellular levels of vitamin C. As is logically expected, focal oxidative stress increases as focal vitamin C stores are depleted and not replenished.

**There could not be a better combination of natural agents to address vitamin C depletion than vitamin C and magnesium, along with hydrogen peroxide, to combat any pathogen presence, early cancer focus, and/or toxin accumulation that is sustaining the inflammation.**

This lack of vitamin C at sites of inflammation nicely explains why the appearance of monocytes initially dominates the acute immune system response to a focally inflamed tissue.[10] The monocytes have an exceptionally high concentration of vitamin C, the highest of all the immune cells. Relative to the plasma concentration of vitamin C, these monocytes concentrate vitamin C in their cytoplasm 80-fold (8,000%) higher than the plasma. Other immune cells also have high intracellular levels of vitamin C, although not as high as the monocytes.[11]

It is no coincidence that the first immune cell arriving at an inflamed tissue site with its severe depletion of vitamin C has the highest vitamin C concentration of all the immune cells and most of the other cells in the body. The acute immune response works to imme-

diately repair the oxidative damage associated with inflammation, while also restoring vitamin C levels to normal in that tissue. Furthermore, when trying to quench inflammation, increased magnesium intake is also essential. This mineral is also present at high levels in monocytes. And finally, many of these sites of inflamed tissue also feature various degrees of pathogen colonization or even overt infection, which accounts for the elevated focal oxidative stress present in those tissues.

In addition to high levels of vitamin C and magnesium, monocytes can also produce substantial amounts of hydrogen peroxide in their immediate environment. There could not be a better combination of natural agents to address vitamin C depletion than vitamin C and magnesium, along with hydrogen peroxide, to combat any pathogen presence, early cancer focus, and/or toxin accumulation that is sustaining the inflammation. Furthermore, vitamin C and magnesium are also natural anti-pathogen agents by themselves.[12-16]

At the same time, as the immune cells migrate directly to the acutely inflamed tissue site, the newly circulating cortisol, along with whatever vitamin C is available in the circulation and extracellular spaces, also works to maximize vitamin C levels in those immune cells. Essentially, the new cortisol release aims to increase vitamin C in both the cells involved at the site of inflammation or infection and in the immune cells themselves (as well as the rest of the cells in the body to a lesser degree).

## Cortisol Physiology

Cortisol, also known as hydrocortisone when administered as a medication, is a hormone classified as a glucocorticoid. Cortisol and hydrocortisone are identical molecules. This hormone is produced in the outer portion (cortex) of the adrenal glands that sit on top of the kidneys. In addition to having a pronounced anti-inflammatory ***effect***, a glucocorticoid like cortisol also increases glucose levels in the blood through a process known as gluconeogenesis in the liver. This

process utilizes some amino acids and other non-carbohydrate molecules to produce more glucose. When cortisol or other corticosteroids are administered at excessively high doses and for prolonged periods, a state of widespread protein breakdown (catabolism with muscle wasting) can occur as the proteins are converted into glucose. Furthermore, this continued stimulation of glucose production along with the liver glucose just accumulating and not being converted into vitamin C can result in higher circulating glucose levels and sometimes even overt diabetes.

**Supplying the right amount of cortisol when it is chronically deficient and no longer being synthesized in normal amounts in the adrenal glands is essential to achieving optimal health...**

These effects account for the most significant side effects of chronic and highly dosed ***synthetic*** steroids (e.g., prednisone, dexamethasone, methylprednisolone). However, even these synthetic steroids, given in ***much lower doses*** than are typically prescribed, would never cause problems if they were given in conjunction with multigram doses of vitamin C.

Of note, taking large enough amounts of vitamin C supplementation alone can eliminate the need for more cortisol to optimize intracellular uptake of the vitamin C. However, it is often not a practical option to administer the 50-, 75-, or 100-gram infusions needed to reach such optimal cellular vitamin C levels without the assistance of cortisol. Nevertheless, cortisol still greatly facilitates this process, and having enough cortisol in the bloodstream decreases the "wasting" of vitamin C by its elimination in the kidneys that could otherwise end up inside the cells.

**Supplying the right amount of cortisol when it is chronically deficient and no longer being synthesized in normal amounts in the adrenal glands is essential**

**to achieving optimal health, similar to the need for thyroid hormone administration when its levels are chronically low.**

Even though the body might have "normal" levels of cortisol upon blood testing at different times in the day, this does not rule out that under conditions of severe stress and new infection/toxin exposure that the adrenals might no longer have the capacity to produce sufficient additional amounts of cortisol to deal with that stress. Normal adrenal glands always increase cortisol production and its release when facing an acute infectious and/or toxic threat. ***Acquiring*** an infection is a direct indication that more cortisol (and vitamin C) was needed by the body to avoid contracting it.

It has been observed that a fatigued individual with known adrenal insufficiency can rapidly progress to an influenza-like state of malaise and generalized aching when cortisol levels are especially low. Patients with clear-cut influenza have markedly low cortisol levels, with the lowest cortisol levels occurring in the sickest patients, who typically have the highest fevers and the lowest white blood cell counts. Any acute severe infection results in the same classical symptoms associated with very low cortisol levels alone, as seen in patients with acute adrenal insufficiency.[17]

Additionally, most people with any chronic degenerative disease are ***at least*** minimally deficient in cortisol production from the adrenal glands. In some cases, when there is a severe, near-scurvy degree of vitamin C depletion in the body, even normal or supranormal releases of cortisol from the adrenals will not make a significant difference in the health of the body. This is because sufficient amounts of vitamin C need to be already present in the extracellular space and available to be ushered into the cells by the amounts of cortisol that are released.

The potent anti-inflammatory effect of cortisol fits perfectly with its label as the anti-stress, "fight-or-flight" hormone.

Physiologically, stress is effectively a surge of pro-oxidants (toxins) into the blood, whether from infection or another source. This results in a need for the body to immediately counteract or compensate with an enhanced antioxidant response.

**Additionally, most people with any chronic degenerative disease are *at least* minimally deficient in cortisol production from the adrenal glands.**

In a ***completely normal animal liver***, vitamin C is synthesized from glucose modified by the sequential action of four enzymes. However, most humans are missing a functional fourth enzyme due to an epigenetic defect in the complete translation of the messenger RNA coding for the enzyme L-gulonolactone oxidase (GULO).

Part of the "fight-or-flight" reaction to stress in the body is also supported by the release of adrenaline (epinephrine) from the inner part (medulla) of the adrenal glands. Adrenaline works to mobilize glucose from its storage form (glycogen) in the liver and muscles, and it also stimulates gluconeogenesis (new glucose production) to increase glucose levels further.[18] This added supply of glucose is critical in making sure that enough glucose is available to the ***fully functioning liver*** to make whatever production of vitamin C is needed to deal with a severe enough acute infection or toxin insult.

Notably, vitamin C supplementation has been shown to decrease circulating cortisol and adrenaline levels in athletes following stressful exercise. This is consistent with the role played by these two substances in increasing vitamin C levels following any form of stress. When sufficient vitamin C is already present, cortisol and adrenaline are no longer as necessary in supporting the body's response to stress, as an increased vitamin C presence reduces their levels.[19]

Nevertheless, the natural design of this anti-stress, antitoxin response in the body is exquisitely elegant when vitamin C synthesis can occur in a completely normal liver, as is the case with most mammals. It can be summarized as follows:

- ✓ The new presence of toxins from pathogens and other sources ("stress") in the blood **results in**
- ✓ a reflex release of cortisol and adrenaline from the adrenal glands, but **preceded** by a limited release of vitamin C from adrenal stores,[20] **followed by**
- ✓ an increased liver production of vitamin C that is released directly into the blood to neutralize the toxin surge and be available for cellular uptake, **resulting in**
- ✓ an oxidative stress-induced acute immune response, **with**
- ✓ an increased uptake of the newly synthesized vitamin C primarily into the toxin-exposed cells and the immune system cells by the increased presence of cortisol in the blood, **which is sustained by**
- ✓ a cortisol-induced increased glucose production (gluconeogenesis) in the liver and an adrenaline-induced release of glucose from its storage forms (glycogen), **which results in**
- ✓ an ongoing conversion of that increased glucose production into more vitamin C production with a continuing release of cortisol to bring the vitamin C inside the toxin/infection-challenged cells, **continuing until**
- ✓ the infection is resolved and/or the toxins are fully neutralized with electrons, metabolized, and excreted.
- ✓ However, in humans, this response ***lacks*** the stress-stimulated synthesis of new vitamin C from glucose stores in the liver. When a sufficient new oxidative stress appears in the blood of a human,

- ✓ There is a minor release of vitamin C from adrenal stores, only slightly preceding the release of cortisol from the adrenals.
- ✓ Cortisol synthesis and release continue as long as oxidative stress remains prominent.
- ✓ Cortisol works to produce new glucose through gluconeogenesis. This glucose gets added to the glucose that is NOT being converted to vitamin C in the liver. If this remains unchecked, advanced glycation products form and accumulate as glucose levels increase, and diabetes sometimes results. Furthermore, the gluconeogenesis uses up skeletal muscle protein, resulting in a muscle-wasting picture.
- ✓ The entire sequence of events continues as long as the new oxidative stress remains unabated. Sufficient supplemental vitamin C can blunt the consequences of the damage inflicted by the unchecked formation and release of new cortisol.

The adrenal glands have the highest concentration of vitamin C in the body, although the total quantity is small due to the size of the glands. One possible explanation for the early release of the adrenal gland stores of vitamin C before the release of cortisol is that it is an adaptive response to the fact that the released cortisol will not be encountering newly synthesized vitamin C from the human liver. Of course, this adaptation will only serve well when the new infectious or toxic stress is limited and not ongoing, or when the stressed individual promptly initiates a vigorous protocol of vitamin C supplementation to work in conjunction with the cortisol.

Without more vitamin C, however, the acute stress response with the release of cortisol and vitamin C from the adrenal glands will quickly "burn out" and no longer significantly impact or resolve the new infectious or toxic challenge. This explains why treatments with extremely potent synthetic corticosteroids, such as prednisone or dexamethasone, quickly reach a state of dimin-

ishing returns, where no significant vitamin C is available to be ushered into the cells, and only the long-term side effects of chronic corticosteroid therapy remain. The lack of vitamin C synthesis with ongoing potent steroid therapy results in chronic wasting of muscle mass, as the steroids continue to produce more glucose (gluconeogenesis) from muscle protein that is not being utilized to make more vitamin C in the liver. This eventually results in a condition of diabetes or prediabetes in many individuals in addition to the wasting of muscle. The absence of more vitamin C in the face of ongoing steroid administration further undermines the immune system's ability to protect the body. ***Immune cells with low vitamin C stores offer little protection.***

***Immune cells with low vitamin C stores offer little protection.***

However, in the typical human who is missing a functioning fourth enzyme in the liver needed to synthesize more vitamin C from glucose, cortisol has only the pre-existing vitamin C circulating in the blood and in the extracellular spaces available for cellular uptake. At the same time, the cortisol- and adrenaline-induced production of more glucose will chronically contribute to its excess presence throughout the body, as it cannot be used to fuel the production of more vitamin C in the liver.

There now exist agents that appear to help the human liver to start making vitamin C again from glucose. Metadichol® is a nano lipid formulation of policosanol that has been shown in studies to increase vitamin C levels between 3- and 12-fold (See Chapter 12). Another agent, hydroxytyrosol, appears to consistently double vitamin C levels in the body. It is an olive-derived polyphenol, and high-quality olive leaf extract supplements are good sources of this agent. Both Metadichol® and hydroxytyrosol are felt to be overcoming, in some manner, the epigenetic defect otherwise preventing GULO from being sufficiently formed from the translation of the

mRNA coding for it.[21] Regular supplementation with either of these products appears to be very effective in optimizing vitamin C's impact in the body, although more research needs to be done to clearly establish the biochemical roles that are being played.

One small study significantly substantiated the ability of hydroxytyrosol to not only help the liver to make vitamin C, but also to make large amounts of it in response to toxic stress. In two volunteers taking hydroxytyrosol, the ingestion of large doses of alcohol (toxin) resulted in dramatic, prompt, and sizeable ***increases*** in vitamin C blood levels that persisted at elevated levels for 24 hours until all alcohol was metabolized. Without new vitamin C synthesis, the presence of a new toxin in the blood should progressively ***decrease*** vitamin C levels to low or even undetectable levels.[22]

**Whenever cortisol is clinically indicated, its impact will be greatly enhanced by the simultaneous administration of vitamin C.**
**— AND —**
**Whenever vitamin C is clinically indicated, its impact will be greatly enhanced by the simultaneous administration of cortisol.**

When acute oxidative stress is due to the onset of infection, rather than solely to the presence of a new toxin in the blood, cortisol-facilitated vitamin C uptake into infected cells also plays a vital role in killing the pathogen. Increased intracellular vitamin C further upregulates the pathogen-killing Fenton reaction. This reaction utilizes the electrons supplied by the cellular vitamin C to break down the cytoplasmic hydrogen peroxide into the highly lethal hydroxyl radical, which immediately oxidizes every biomolecule it encounters, ultimately resulting in pathogen death, programmed cell death (apoptosis), and/or frank cellular rupture.[23]

Vitamin C and cortisol have such a vital interrelationship that it can be said that:

> **Whenever cortisol is clinically indicated, its impact will be greatly enhanced by the simultaneous administration of vitamin C.**
>
> **— AND —**
>
> **Whenever vitamin C is clinically indicated, its impact will be greatly enhanced by the simultaneous administration of cortisol.**

## Vitamin C-Cortisol Synergy: Supporting Research

The nature of this important interplay between vitamin C and cortisol is further clarified by a substantial amount of clinical, animal, and cell research data.

- ✓ In human lung microvascular endothelial cells, vitamin C and hydrocortisone work synergistically and dramatically to reverse lipopolysaccharide-induced (oxidative) barrier dysfunction.[24]
- ✓ In a rat model of kidney reperfusion injury, vitamins C and E, in combination with hydrocortisone, appear to offer synergistic protection compared to that provided by the individual agents.[25]
- ✓ Hydrocortisone function, or expression, depends on the redox status of its intracellular receptor. When a substantial percentage of the receptors are oxidized, the degree of hydrocortisone binding to its receptors is lessened, and hydrocortisone can no longer effectively optimize vitamin C uptake into the cell.[26]
- ✓ A vitamin C derivative restored electrons to oxidized hydrocortisone receptors, which allowed them to function.[27] Such inactivated receptors are increased in number in the highly oxidized environment of infection. This means that sufficient vitamin C

is needed to keep receptors activated and able to bind whatever hydrocortisone is present inside the cell, which then can further facilitate the uptake of more vitamin C.

**A classical interrelationship: more cellular vitamin C leads to more cortisol receptor binding, and more cortisol receptor binding leads to more cellular vitamin C uptake.**

✓ In patients with asthma, vitamin C supplementation has been shown to reduce the corticosteroid dose required to maintain control of the condition, further supporting the similar physiological effects of vitamin C and hydrocortisone.[28]

The degree of infection (as with mild influenza versus advanced sepsis) largely determines whether administering hydrocortisone will be of significant additional benefit in the treatment protocol. Advanced sepsis is a condition in which systemic oxidative stress is approaching the maximal degree just before proceeding to death. ***This results in a very substantial percentage of the intracellular hydrocortisone receptors throughout the body being in a nonfunctional, oxidized state***. Because of this, the body attempts to compensate by increasing the production of cortisol in the body, although this offers little to no benefit as long as the receptors remain oxidized and unable to bind any cortisol, and no vitamin C is being administered to reactivate the receptors. Furthermore, since vitamin C is needed to reduce the oxidized intracellular cortisol receptors, only very large amounts of vitamin C will allow enough vitamin C to enter the cells and reduce those receptors, and then further facilitate new vitamin C cellular uptake.

In less advanced infections, and even in the earliest stages of sepsis, the number of cortisol receptors is often increased but not yet massively oxidized, and administering hydrocortisone can have clear-cut benefits, especially when vitamin C is also given.[29] In fact, increased receptor

function is essential to prevent a person or laboratory animal with early sepsis from progressing to advanced sepsis and death.

However, as the infection progresses, the receptors become increasingly oxidized and inactive due to the heightened systemic oxidation associated with the worsening infection, and the body then transitions to chronically increased cortisol production in a futile attempt to compensate.[30-31] This rarely stops the clinical decline unless the underlying infection responds dramatically to other anti-infection and shock-reversing measures that have been taken. Instead, death quickly ensues unless enough vitamin C is given to reactivate (reduce) the oxidized cortisol receptors and further increase intracellular levels of vitamin C. Similar findings have been seen in an animal model of sepsis.[32]

The treatment of patients in septic shock with vitamin C, hydrocortisone, and thiamine was reported to be stunningly effective, with the mortality rate dropping from 40% to 9%, and with none of the deaths resulting directly from sepsis or septic complications.[33] However, a similarly constructed study showed that the ***same result*** could be achieved with ***only the administration of similarly dosed vitamin C***.[34] This fits with the observation that circulating endogenous levels of cortisol are ***already elevated*** in advanced sepsis, and it is vitamin C administration, not additional hydrocortisone, that is of most consequence at that point in the treatment of a septic patient. Notably, as primary or secondary therapy, vitamin C has also attenuated sepsis-induced adult respiratory distress syndrome,[35] aspiration-induced adult respiratory distress syndrome,[36] virus-induced adult respiratory distress syndrome,[37] and adult respiratory distress syndrome secondary to the complications of pustular psoriasis.[38]

**The best therapy for any advanced sepsis patient would be very large doses of vitamin C intravenously, on the order of 25 grams every six hours (100 grams every 24 hours).**

This can be further optimized by administering 1 to 2 grams of magnesium chloride intravenously every six hours, in addition to the vitamin C infusion.

In sepsis the pre-existing high circulating levels of cortisol would increase cellular uptake of the highly dosed infusion of vitamin C as the oxidized cortisol receptors are once again activated from the reduction of the elevated intracellular oxidative stress levels to normal or near-normal levels. All but those sepsis patients who had already developed too much multi-organ damage would be readily saved.

On the other hand, many critically ill patients who are dealing with increased oxidative stress, but not to the extreme levels seen in advanced sepsis, will demonstrate significantly ***low*** cortisol levels,[39], and they would greatly benefit from the administration of both vitamin C and hydrocortisone at the beginning of treatment. However, as noted above, administering large enough doses of vitamin C intravenously will also be very effective. Toxic epidermal necrolysis, a severe life-threatening condition, responded promptly and completely resolved in about 10 days with a protocol of hydrocortisone 50 mg and 1,500 mg of ascorbic acid given IV every six hours. Thiamine 200 mg IV was also given every 12 hours.[40]

**Whenever there is a question of whether cortisol levels are already high in the face of advanced infection, the addition of further hydrocortisone does no harm. It can readily be added to the protocol to "cover all bases."**

## Vitamin C and Cortisol Safety

Before proceeding to the recommended applications of a combined therapeutic approach with vitamin C and hydrocortisone, the current state of propaganda directed at undermining and

limiting the use of these agents should be addressed. Most physicians have been completely misled into believing that vitamin C is toxic to the kidneys and promotes the formation of kidney stones. ***Nothing could be further from the truth***. As with all other organs in the body, vitamin C, when taken in multigram daily doses, promotes good health throughout the body, including the kidneys. A Harvard study of 85,557 women with no history of kidney stones found that regular vitamin C intake was not associated with an increased risk of developing kidney stones.[41] Another Harvard study found that individuals with the highest vitamin C intake had a ***lower*** risk of kidney stones than those with the lowest vitamin C intake.[42] This was further corroborated in another study looking at blood levels of vitamin C in over 10,000 subjects. Subjects with the highest blood levels had the lowest incidence of kidney stones.[43]

Multigram doses of vitamin C given intravenously also cause no problems with kidney function and do not promote the formation of kidney stones. Such infusions achieve temporary blood levels that are much higher than those achieved with oral administration, yet they are still completely nontoxic. A prospective study following 157 patients who received such infusions showed no development of kidney problems over 12 months. No stones were reported, despite 8% of the patients ***already having a history of kidney stones***.[44]

Vitamin C, along with magnesium, vitamin D3, and vitamin K2, all work to prevent stone formation ***as well as to dissolve and mobilize existing stones***. This is because stones are usually calcium oxalate, and the oxalate that can come from vitamin C metabolism will never produce a stone in the absence of excessive calcium presence.[45] In fact, even though it is chemically a weak organic acid, vitamin C (ascorbic acid) puts calcium carbonate into solution as readily as a concentrated inorganic acid, like hydrochloric acid.[46]

Aside from the concern generated by vigorous promotion of the myth that vitamin C causes kidney stones, many physicians seem to think it must be toxic and would not even consider giving

it intravenously. Vitamin C might be the only substance for which a toxic level cannot be established. Continuous vitamin C infusions of 50 grams daily were given over eight weeks in advanced cancer patients with no definable adverse side effects.[47] A study surveying the administration of infusions routinely exceeding 25 grams in over 20,000 patients cared for by 172 complementary medicine practitioners revealed the infusion to be "remarkably safe".[48] At the Riordan Clinic in Wichita, KS, over 16 years, "…194,054 g, or 427 lbs of IV vitamin C" was administered to 275 patients with no significant side effects ever observed.[49] For even further perspective on this remarkable lack of toxicity by vitamin C, consider the fact that too much water ingested too rapidly can kill.[50]

When considering the safety of cortisol, it is important to realize that it is the ***natural*** steroid hormone made by the adrenal glands, and its secretion from these glands is the ***natural*** response to oxidative stress in the blood. All doctors and most of the public know that high doses of ***synthetic*** corticosteroids given for an extended period have severe and inevitable adverse side effects. This has led to the more routine applications of much lower doses of cortisol (identical to hydrocortisone, its prescribed form) being approached with ***unnecessary*** caution.

Very many people have abnormally low circulating levels of cortisol, just as many individuals have low or suboptimal levels of the sex hormones and thyroid hormone. Taking hydrocortisone under those circumstances not only corrects the underlying deficiency, but it also often works to "rest" the challenged adrenal glands. In some cases, this allows for sufficient glandular recovery such that hydrocortisone can be later discontinued or at least minimized in dose.

Unfortunately, hydrocortisone has had to bear the reputation that has resulted from the negative consequences of chronically prescribed synthetic corticosteroids. Two commonly prescribed synthetic corticosteroids are prednisone and dexamethasone.

Physiologically, prednisone is 4 times more powerful than cortisol, and dexamethasone is about 30 times more potent than cortisol. Also, cortisol has a much shorter half-life and duration of action than these synthetic drugs, and they are typically applied in much higher single doses than cortisol. A dose of prednisone given for an acute inflammatory syndrome is often 60 mg. This equates to a cortisol dose of 240 mg.

**Most physicians have been completely misled into believing that vitamin C is toxic to the kidneys and promotes the formation of kidney stones. *Nothing could be further from the truth.***

Prednisone and dexamethasone are long-acting physiological ***sledgehammers*** compared to the relatively fleeting and gentle physiological actions provided by cortisol. And when these synthetic steroids are ***not*** given along with vitamin C, which is virtually always the case, the patient is just left with long-term side effects (muscle wasting, diabetes) as the limited extracellular levels of vitamin C are ushered into the cells and never significantly restored for future cellular uptake. Furthermore, and ***perhaps the main side effect*** of chronic synthetic corticosteroid therapy, the extracellular spaces in the body are even more chronically depleted of vitamin C than the intracellular spaces. Depending on the dietary and supplemental habits of a steroid-treated patient, as well as what diseases that patient might already have, ***the body will be left in a state of minimal to moderately advanced scurvy.***

It is essential to realize that the degree of stress-induced cortisol release can be significantly decreased even when the ***non-stressed circulating levels are within the range considered to be normal***.

If most people were routinely tested for their circulating cortisol levels and the degree to which they can increase cortisol release in response to stress, the routine administration of cortisol in daily doses of 20 mg or less would be commonly employed in acute infections ***as well***

***as in the long-term treatment of chronic medical conditions***.[51] A small daily dose of hydrocortisone would be beneficial for everyone, and it would never result in long-term adverse steroid side effects.

**When considering the safety of cortisol, it is important to realize that it is the *natural* steroid hormone made by the adrenal glands, and its secretion from these glands is the *natural* response to oxidative stress in the blood.**

Applied in this fashion, a hormone ***deficiency*** is being addressed, preventing far more problems than would be seen by reflexively avoiding hydrocortisone replacement. When synthetic corticosteroids are prescribed, their effects are many-fold more potent than hydrocortisone, and adverse side effects can reliably be anticipated. Just as testosterone replacement is optimal when low blood levels have been identified, taking high doses chronically beyond simple replacement will always harm the body.

**It is crucial to recognize that restoring a deficient hormone is always desirable, whereas chronically administering a hormone above its normal requirements is never desirable.**

Restoring deficient natural hormone levels is classic Orthomolecular Medicine, not "prescriptive medicine," which only attempts to achieve symptom lessening without regard to any underlying impact on the disease pathophysiology. Also, in contrast with traditional medicine, you never get the side effects of excess hormone administration. You simply achieve the benefits of returning to a normal hormone status.

## Recap

A cell is healthy when it has and maintains normal intracellular levels of reduced vitamin C. The role of the immune system, despite its seemingly enormous complexity, is to alleviate inflammation and restore health to the affected cells and tissues in any disease or medical condition. Such cells are always characterized by increased oxidative stress (or increased IBO), decreased levels of reduced antioxidants, and the physical appearance and/or laboratory evidence of inflammation.

> **The role of the immune system is to limit and reverse tissue damage (inflammation) and subsequently to restore and maintain healthy tissue. It can ONLY achieve this by restoring intracellular vitamin C levels to normal.**

While high enough doses of vitamin C can bring many inflamed cells back to normal without hydrocortisone assistance, such dosing is not routinely available to most patients, and it can be quite costly. Hydrocortisone plays an active role in facilitating the uptake of vitamin C, the most impactful of all anti-inflammatory agents in existence, into the cells of the body. This is why hydrocortisone is considered to be an anti-inflammatory agent. By itself, however, hydrocortisone is not an anti-inflammatory; it merely results in an anti-inflammatory effect by facilitating the uptake of vitamin C into cells.

When there is no longer a significant presence of vitamin C available to be ushered into the cells from the extracellular spaces, hydrocortisone cannot halt or reverse inflammation. Since the ultimate health of any cell is directly reflected in the vitamin C status in the cytoplasm, attention should always be paid to taking whatever measures are available for optimizing the concentrations of vitamin C in all the cells of the body.

While highly enough dosed vitamin C does not require "assistance" to optimize its intracellular levels, relatively few physicians are comfortable applying high enough doses of vitamin C for a long enough time. Because of this, combining hydrocortisone with lower-dose vitamin C can significantly increase the number of patients who can still optimize their cellular health with vitamin C therapy, making this approach more acceptable to many open-minded yet still reluctant healthcare practitioners.

The most important points to take away from this chapter:

- ✓ All diseases are characterized by decreased intracellular vitamin C levels in the affected cells.
- ✓ No disease can exist when intracellular vitamin C levels are normal in the affected cells.
- ✓ Cortisol/hydrocortisone is essential in reaching and maintaining normal intracellular vitamin C levels.
- ✓ Inflammation = decreased vitamin C levels in the affected tissue
- ✓ Decreased vitamin C levels = inflammation in the affected tissue
- ✓ ***The primary role of the immune system and the immune response is to restore normal vitamin C levels in inflamed tissues.***

## Chapter 12

*No one is more hated than he who speaks the truth.*

Plato

# Vitamin C: The Premier Antioxidant

## Supremacy in Restoring Oxidized Biomolecules

Vitamin C, until it has been extensively metabolized, is present in the body in its reduced form (AA—ascorbic acid) and its oxidized form (DHAA—dehydroascorbic acid). It is also present in the blood in a one-electron depleted state as the ascorbyl radical, which can give or take another electron depending on the microenvironment in which it is found in the body, effectively serving as a circulating electron buffer in the blood.

While nutrient molecules have antioxidant impact in the body and can work to return oxidized biomolecules to their active, reduced state through either direct or indirect mechanisms, vitamin C reigns supreme as the most critical antioxidant for sustaining the overall health of the body. Increased oxidative stress, meaning an excess of biomolecules being in a metabolically inactive, oxidized state, is the underlying pathology in all diseases. Working synergistically with the antioxidant matrix throughout

the body, vitamin C represents the primary defense against electron-hungry toxins by quenching them before they oxidize biomolecules. Additionally, it serves as the mechanism for reducing oxidized biomolecules previously inactivated by the toxins and restoring them to a normal functioning state.

## Unique Antioxidant Abilities

While any antioxidant under the right chemical microenvironment inside the body can exert the protective and reparative properties of vitamin C in dealing with toxins, excess oxidation, and infections, vitamin C remains unique. No antioxidant other than vitamin C possesses all the following qualities and abilities:

- ✓ A small molecule that is present in all the cells of the body[1-2]
- ✓ Supports the regeneration (reduction) of many different types of antioxidants and biomolecules, maintaining a strong antioxidant matrix throughout the body[3]
- ✓ Readily recycles vitamin E to help protect lipids and the cell membranes against oxidative stress, even though it cannot directly access those substances, as it is water-soluble and not fat-soluble[4]
- ✓ Can enter the cells through specific active membrane transporters[5-7]
- ✓ Can enter the cells competitively with glucose through passive glucose membrane transporters, facilitated by insulin[8-9]
- ✓ Can enter the cells passively through the cell membrane[10-12]
- ✓ Also has easy access to all subcellular compartments once inside the cells[13]
- ✓ Can donate two electrons per molecule rather than one[14-15]

- ✓ Has a stable one-electron-depleted intermediate state (ascorbyl radical), allowing it to be optimally responsive to the immediate reduction or oxidation needs of the microenvironment in which it is found. When ascorbyl radical loses an additional electron, it becomes dehydroascorbic acid (DHAA).[16-17]
- ✓ When depleted severely enough and long enough, a unique and uniformly fatal deficiency disease develops (scurvy).

## Important Historical Context

Frederick R. Klenner, MD, was the first person (and physician) to recognize and utilize the significant positive impact of administering vitamin C to patients with a wide range of conditions, particularly for infectious diseases and excessive toxin exposures, or poisonings. Dr. Klenner published 27 papers documenting his clinical results with vitamin C. He asserted that he had never seen a patient who did not benefit from vitamin C. His experiences were so positive that he further stated, "Vitamin C should be given to the patient while the doctors ponder the diagnosis."[18-19]

It was the Hungarian biochemist Albert Szent-Gyorgyi who discovered vitamin C and described the process of oxidation. For this, he was awarded the Nobel Prize in Physiology or Medicine in 1937.[20] However, the "genius" of somehow realizing that this newly discovered vitamin C could be safely given to any patient in large, multigram doses intravenously and orally, while achieving phenomenal clinical results that had never been seen before with anything else, belongs solely to Dr. Klenner.

More specifically, Dr. Klenner documented the ability of vitamin C to reliably cure many different acute infectious diseases for which no other cures have yet been shown to exist by traditional medicine. Furthermore, Dr. Klenner also demonstrated that vitamin C could reliably neutralize any toxin excesses that might be

present in a patient when administered in sufficient doses and for a long enough period.

Following Dr. Klenner, prominent researchers and clinicians who have continued to keep vitamin C at the forefront of effective medical care include the following:

- ✓ Irwin Stone, PhD, biochemist and author. Dr. Stone compiled an impressive book documenting the literature-established track record of vitamin C in clinical medicine.[21] He was also instrumental in getting Linus Pauling, PhD, interested in the properties and applications of vitamin C.
- ✓ Linus Pauling, PhD, a double Nobel Prize winner in the categories of Chemistry and Peace, published books that significantly raised the profile of vitamin C as a potent therapeutic agent worldwide.[22-23]
- ✓ Hugh Riordan, MD, who founded the Riordan Clinic in 1975, strongly promoted vitamin C therapy, particularly when administered intravenously in high doses, until his death in 2005.
- ✓ Ron Hunninghake, MD, who has worked at the Riordan Clinic for over 30 years, has overseen the administration of more than 175,000 vitamin C infusions, with the majority administered at a dose of 50 grams. Numerous variations of vitamin C therapy have been investigated and applied in clinical settings, with a substantial body of research on vitamin C having been published.
- ✓ Jason West, DC, ND, after training at the Riordan Clinic, has incorporated vitamin C in nearly all his clinical protocols and has given many thousands of IV vitamin C infusions since that training. He established a

highly effective clinical protocol that aims to administer a total of 1,000 grams intravenously over several clinic visits (the million-milligram protocol), yielding excellent clinical results.

- ✓ Atsuo Yanagisawa, MD, PhD, after training with Dr. Hunninghake, started the administration of vitamin C, especially intravenously, in Japan. Since its inception in 2007, the Japanese College of Intravenous Therapy has had a membership of over 1,000 medical professionals practicing in more than 700 clinics throughout Japan, all of whom focus on the widespread utility of vitamin C in various treatment protocols.

Many other healthcare providers around the world have been regularly incorporating vitamin C into their patient treatment protocols for years. Certainly, many other such providers, not named, have nevertheless been major contributors to the promotion and evolution of vitamin C therapy.

## Significant Vitamin C Research Findings

### Anti-Pathogen

Vitamin C has been shown to inactivate ("kill") all viruses in the test tube (*in vitro* studies) when it has been appropriately applied. Some such examples include the following:

- ✓ Poliovirus: Vitamin C has been shown to readily inactivate this virus, rendering it completely non-infectious when the treated virus was injected directly into the brains of monkeys.[24]
- ✓ Herpesviruses[25-26]
- ✓ Vaccinia viruses[27-28]

- ✓ Tobacco mosaic virus[29]
- ✓ Enteroviruses[30]
- ✓ Influenza virus[31]
- ✓ Rabies[32]

Examples of vitamin C resolving acute viral syndromes in patients *(in vivo* studies):

- ✓ Polio, complete cure in 60 out of 60 cases in 3 to 5 days with injected vitamin C[33]
- ✓ Polio, complete cure in 3 of 5 cases; the other 2 cases with some residual muscle weakness following infection resolution; dosing ***oral only***, with 50,000 to 80,000 mg total being given over a week to 10 days[34]
- ✓ Another clinician showed that much lower doses of oral vitamin C were still very effective in shortening the time needed to recover from polio infections[35]
- ✓ Prompt resolution of acute viral hepatitis with oral and/or intravenous administrations of vitamin C[36-40]
- ✓ Resolution of acute viral encephalitis presenting in a comatose state[41-43]
- ✓ Measles, simple and complicated
- ✓ Mumps, simple and complicated[44]
- ✓ Herpes, chickenpox[45]
- ✓ Rabies (no human studies); guinea pigs showed improved survival with vitamin C[46]
- ✓ Examples of vitamin C efficacy in non-viral infections:
- ✓ Diphtheria, tetanus, staphylococcus, streptococcus, and pseudomonas, all documented as curable

- ✓ Rheumatic fever is reliably cured.[47]
- ✓ Vitamin C is very effective in supporting the resolution of malaria, leprosy, typhoid fever, brucellosis, trichinosis, dysentery (both amebic and bacillary), and trypanosomal infections, such as Chagas' disease.

While vitamin C is an absolute virucide, it also often kills pathogenic bacteria (bactericidal) and nearly always stops their growth (bacteriostatic). Furthermore, vitamin C is essential for a robust and optimally competent immune system.[48]

Vitamin C has also been shown to be of clear benefit, sometimes resulting in a complete clinical resolution in the following conditions:

- ✓ Lyme disease, AIDS, and HIV+ syndromes, chronic hepatitis, persistent spike protein syndrome—these conditions appear to feature "embedded" pathogens that are not easily accessible, as they would be in the circulating blood.
- ✓ Common cold—while vitamin C always alleviates cold-related symptoms and pathology, a very high amount of vitamin C is needed to neutralize the very high virus titers seen in this condition.
- ✓ Tuberculosis—although clinical responses are slow due to the growth rate of the involved pathogen, a large body of literature documents the benefits of vitamin C in treating this infection.

Due to the pro-oxidant nature of toxins and the antioxidant properties of vitamin C, vitamin C has been documented as the ultimate nonspecific antidote to toxins, both *in vitro* and *in vivo*, in animals and humans. Examples of toxic agents neutralized by vitamin C are listed in Chapter 1.

Radiation toxicity also inflicts its damage by depleting vital biomolecules of electrons, leaving them in a metabolically nonfunctional, oxidized state. Vitamin C has been shown to reduce radiation-induced tissue damage as well as to decrease mortality when otherwise fatal doses of radiation have been administered. The radiation can come in the form of the intake of radioactive elements or just the exposure to high enough doses of gamma radiation.[49-55]

In Japan, after the tsunami-induced breach of the Fukushima Daiichi nuclear power plant in 2011, the Japanese College of Intravenous Therapy (JCIT) treated exposed individuals with vitamin C-centered therapies. In an unpublished study, five Fukushima nuclear plant workers with heavy radiation exposure received intravenous vitamin C twice a month, in addition to regular supplementation with oral liposome-encapsulated vitamin C, alpha-lipoic acid, selenium, and a multivitamin preparation. Over a two-month treatment period, statistically significant drops were seen in laboratory testing for free DNA (a measure of radiation damage), as well as in a multifactorial Cancer Risk Score evaluation.

**Due to the pro-oxidant nature of toxins and the antioxidant properties of vitamin C, vitamin C has been documented as the ultimate nonspecific antidote to toxins, both *in vitro* and *in vivo*, in animals and humans.**

## Antitoxin

As vitamin C can both quench pro-oxidant toxins directly through electron donation (reduction) and/or repair the oxidative damage already inflicted by a toxin exposure, it is also the ***ideal*** agent for dealing with acute, subacute, and chronic toxin exposures, including drug overdoses and accidental or intentional poisonings. Combined with its anti-pathogen properties, vitamin C

therapy should be an essential part of any treatment for infections or infectious diseases, as the toxins they generate are what causes the damage, or what eventually kills, the host. Furthermore, the toxin exposure induces a bodywide vitamin C depletion which needs to be addressed.

**While vitamin C is an absolute virucide, it also often kills pathogenic bacteria (bactericidal) and nearly always stops their growth (bacteriostatic).**

## Clinical Application Factors

The goal of any clinical protocol treating any condition should always include measures designed to optimize intracellular (cytoplasmic) levels of vitamin C. When any cell in the body has optimal levels of vitamin C in it, it is physiologically normal, and no excess oxidation is present any longer among the cellular biomolecules. Generally, when cells are normal, the extracellular spaces are also normal, with a normal balance of reduction and oxidation.

Multiple factors can influence the clinical impact of vitamin C administration in patients. These factors include the following:

- ✓ Dose
- ✓ Route of administration
- ✓ The rate of administration when given intravenously
- ✓ Frequency of administration
- ✓ Duration of the administration protocol
- ✓ Form of vitamin C
- ✓ Synergistic therapies, such as hydrocortisone, or other bio-oxidative therapies such as hydrogen peroxide, ozone, ultraviolet

light blood irradiation applications, and
Hyperbaric oxygen therapy (HBOT)

### *Dose*

As the saying goes in real estate, the three most important factors are "location, location, and location." Similarly, with vitamin C therapy, the three most important factors are "dose, dose, and dose." Small doses can have an inconsequential clinical impact, while larger doses can be curative, especially in treating infections. The literature abounds with vitamin C studies that use 500 ***mg*** orally or less daily, and then "conclude" that vitamin C was of no benefit for the infection, toxin, or disease being studied. Most adults will benefit significantly from 50-***gram*** infusions of vitamin C for most conditions. However, for larger bodies, infusions of 75 to 150 grams of vitamin C can be indicated for an optimal response.

### *Route of Administration*

Vitamin C can be given intravenously, intramuscularly, orally (regular forms or liposome-encapsulated), rectally, by nebulization, and topically on the eyes or in the ears, and both on the skin as well as through it (transdermally). Delicate areas, such as on the eyes or in the respiratory tract, are best treated with pH-neutral vitamin C solutions (as sodium ascorbate or properly buffered ascorbic acid). Rectal administrations can be applied, but are not generally necessary since any inflammatory conditions of the intestine or colon can be effectively treated with oral vitamin C at or exceeding bowel tolerance. Rarely, a retention enema can be used to administer additional vitamin C to the body.

When regular (not liposome-encapsulated) vitamin C is being administered, the intravenous route is always the most desirable (as sodium ascorbate or buffered ascorbic acid, especially when augmented by hydrocortisone). However, intramuscular admin-

istration can be very effective and can be the preferred method for babies or toddlers when the intravenous route is not easily accomplished. This intramuscular route was directly addressed by Dr. Klenner:

> **"In small patients, where veins are at a premium, ascorbic acid can easily be given intramuscularly in amounts up to two grams at one site. Several areas can be used with each dose given. Applying ice to the gluteal muscles until they turn red almost eliminates the pain. We always reapply the ice for a few minutes after the injection is administered. Ascorbic acid is also given, by mouth, as follow-up treatment."**[56]
> *[Dr. Klenner would typically give his ascorbic acid buffered to a more neutral pH with sodium bicarbonate.]*

Vitamin C can be taken orally in any of several ascorbate forms (hydrogen [ascorbic acid], sodium, magnesium, potassium, calcium, manganese, zinc, molybdenum, and chromium). The most common forms are ascorbic acid and sodium ascorbate. Calcium is often used as a "buffered" form of vitamin C that is easy on the stomach, although sodium ascorbate achieves the same goal. Discussed elsewhere (see Chapter 3), however, is the fact that supplemental calcium needs to be avoided as it is a major player in provoking and sustaining increased intracellular oxidative stress in the cells throughout the body. The other forms work well, but unnecessarily increase the cost of the vitamin C bill. Also, to take the recommended daily multigram doses of vitamin C, the other forms could end up supplying toxic levels of the associated mineral (except for the magnesium ascorbate).

Vitamin C can also be taken in a liposome-encapsulated form. Although such a form is administered orally, it is capable of raising intracellular levels of vitamin C even more effectively than regular, unencapsulated vitamin C adminis-

tered intravenously. Some key features of liposome-encapsulated agents, including vitamin C, include the following:

- ✓ Rapid and nearly complete absorption orally[57]
- ✓ Delivery to the intestinal lymphatics[58-62]
- ✓ Protection of the encapsulated agent from gastrointestinal degradation[63]
- ✓ Prevention of stomach sensitivity to the agent
- ✓ Intracellular bioavailability[64-67]
- ✓ Energy-sparing intracellular delivery of the encapsulated agent. The active transport of unencapsulated vitamin C across cell membranes requires energy consumption.[68-73]

Additional benefits of liposome-encapsulated supplementation due to its phosphatidylcholine content:

- ✓ Antioxidant impact[74-76]
- ✓ Anti-atherosclerotic impact[77]
- ✓ Cholesterol lowering[78]
- ✓ Alleviation of fatty liver and obesity[79-80]
- ✓ Protection against ischemic injury[81]
- ✓ Cell membrane repair[82]

### *Rate of Administration*

Vitamin C can be administered rapidly via IV push or as a several-hour infusion. Important factors that determine the rate of administration include the following:

- ✓ The clinical stability of the patient
- ✓ Whether the condition is localized or systemic
- ✓ Whether the condition is an infectious disease (which also involves toxins)

- ✓ Whether the condition is purely a toxin exposure
- ✓ Whether the condition is acute or chronic
- ✓ Comfort of the infusion; infusion pain should never be present

Imminently life-threatening situations may require a rapid infusion of vitamin C (such as 50 grams in 20 to 30 minutes) or even a more rapid administration by an IV push (several grams in a minute or two).

Dr. Klenner reported the following dramatic case history supporting the value of IV push vitamin C:

> **"An adult male came to my office complaining of severe chest pain and the inability to take a deep breath. Stated that he had been 'stung' or 'bitten' 10 minutes earlier. Thinking that it was Black Widow and not bothering to look for fang marks, due to the gravity of the situation, I gave one gram of calcium gluconate intravenously. This gave no relief. He begged for help, saying he was dying. He was becoming cyanotic. Twelve grams of vitamin C were quickly drawn into a 50 cc syringe and, with a 20-gauge needle, administered intravenously *as fast as the plunger could be pushed*. Even before the injection was completed, he exclaimed, 'Thank God.' The poison had been neutralized that rapidly."** [emphasis mine][83]

The toxin was later identified at Duke University to be the venom of the Puss Caterpillar, a very toxic and large insect resembling a small mouse-like animal.[84]

The chemical structure of vitamin C also results in a unique reaction when administered rapidly and in sufficiently large doses intravenously. Glucose is the substrate used by animals (and man in the past before acquiring an epigenetic defect) to produce vitamin C

in their livers. Due to this, vitamin C is structurally very similar to glucose. And because of this close similarity, the pancreas "views" vitamin C in the blood as though it were glucose. This results in the pancreas reflexively releasing substantial amounts of insulin to deal with what it ***perceives*** as a considerable amount of glucose. Additionally, many glucometers misread circulating vitamin C as glucose, just as the pancreas does, and individuals with diabetes can inadvertently administer excessive doses of insulin after receiving intravenous vitamin C because of a falsely high glucose reading on the glucometer, resulting in symptomatic hypoglycemia in such individuals.

**From a physiological perspective, this response to vitamin C can be regarded as an *endogenously induced* form of IPT.**

Insulin potentiation therapy (IPT) is a treatment protocol designed to increase cell permeability and enhance the uptake of extracellular agents into the cytoplasm of body cells by inducing hypoglycemia through the administration of insulin injections.[85] IPT has been primarily utilized clinically to treat cancer patients with much lower, and accordingly less systemically toxic, doses of chemotherapy. Insulin has long been recognized for its ability to increase cellular uptake of various agents, although the precise mechanisms underlying this effect have not been fully established.[86-92] Insulin has also been established to increase the permeability of the blood-brain barrier.[93-94]

Multigram doses of vitamin C given rapidly enough will induce a release of insulin and a subsequent significant drop in glucose, along with the symptoms of hypoglycemia virtually identical to those caused by a direct insulin injection. From a physiological perspective, this response to vitamin C can be regarded as an ***endogenously induced*** form of IPT. The major difference is

that a large amount of vitamin C is also present in the circulation and is available for delivery into cells as glucose levels drop. This should only prove to be of additional benefit compared to "regular" IPT since vitamin C is an effective anti-cancer agent by itself.[95] Increased cellular vitamin C also increases cellular ATP formation.

The effect that vitamin C has on the pancreatic release of insulin also offers additional potential benefits. Since insulin has been shown to improve the intracellular delivery of various agents, taking nutrient supplements orally approximately one hour before the rapid infusion of vitamin C may significantly enhance their cellular concentrations.

## *Frequency of Administration*

Administering vitamin C more frequently ensures a more persistent presence of the vitamin C in the blood and body than if it is given only once a day, as normal kidney function quickly filters out a substantial portion of the dose. This is especially important when treating critically ill patients with infectious conditions, such as sepsis and septic shock. Administering 50 grams as a one-time daily infusion will generally have a less dramatic effect in treating such patients than administering 25 grams every six hours (same total dose) over 24 hours. However, for patients with cancer or other chronic degenerative diseases, the exceptionally high blood levels that can be reached temporarily with a one-infusion approach might be preferable.

To date, few hospitals around the world permit the infusion of vitamin C, which limits the clinician to an administration schedule within the operating hours of the outpatient clinic being used, unless the patient is already "out of reach" due to hospitalization. Regardless, the ultimate guide to administering vitamin C to acutely ill patients is the judgment of the treating clinician. With acute infectious diseases, Dr. Klenner would always initiate

treatment with a high dose of vitamin C. If a significant positive clinical response was not observed within a few hours, the dose would be repeated. However, substantial improvement often occurs, and lower dosing can then be administered less frequently until complete recovery is achieved.

### *Duration of Administration*

The duration of a vitamin C administration protocol needs to be long enough to allow for complete eradication (infection) and/or neutralization (toxin) of the disease or infection being treated. For severe and life-threatening infectious diseases, vitamin C should be continued at relatively high and frequent doses for at least 24 to 48 hours after it appears that clinical normalcy has been restored. When a positive response is followed by too quick an attenuation or cessation of vitamin C, a complete clinical relapse is possible. This is analogous to the standard way in which antibiotics are prescribed: "Even if you feel well, take the full 10- to 14-day prescription."

### *Form of Vitamin C*

The active part of any vitamin C formulation is the anion, or ascorbate. Ascorbate can be accompanied by any of several cations, including hydrogen, sodium, calcium, potassium, magnesium, or a few other minerals. These forms all deliver vitamin C, but their relative impact and toxicity can vary widely depending on the cation attached to the ascorbate anion.

The best and most common forms of vitamin C are ascorbic acid (hydrogen ascorbate) and sodium ascorbate. The main downside of ascorbic acid is an upset stomach for a few sensitive individuals. Sodium ascorbate does not upset the stomach, and the fears that the sodium content of this form can aggravate hypertension or congestive heart failure are unwarranted, as only sodium accompanied by chloride appears to have this effect.[96-97]

Calcium ascorbate is marketed as "buffered" vitamin C, and it causes no stomach upset. However, supplemental doses of calcium should be avoided entirely, as excess calcium has a wide range of adverse effects, including an increase in all-cause mortality.[98]

The mineral ascorbates are good supplements, but to obtain a therapeutic daily dose of vitamin C, the supplemented mineral could reach toxic levels. An exception to this is magnesium ascorbate, an excellent supplement supplying two vital nutrients. However, taking magnesium and vitamin C separately would be more economical to achieve the optimal amounts of both on a daily basis.

**The duration of a vitamin C administration protocol needs to be long enough to allow for complete eradication (infection) and/or neutralization (toxin) of the disease or infection being treated.**

Several supplements are marketed today as "natural vitamin C" or "vitamin C complex." Several of these companies even go so far as to say ascorbic acid (or any form of ascorbate) is not vitamin C. While such an assertion is so outlandish as to be absurd, it causes many consumers to have unnecessary doubts about the benefits of their chosen vitamin C supplement. The literature contains tens of thousands of articles establishing the numerous benefits of vitamin C, also known as ascorbic acid or sodium ascorbate.

In addition to trying to convince the public that ascorbic acid is not vitamin C, some supplement companies also want the consumer to think that ascorbic acid is of relatively little use or benefit in the body if it is not ingested in a "natural" form. It is also asserted that many of the vitamin C supplements sold are synthetic and not directly derived from natural sources. But properly purified, vitamin C is vitamin C, regardless of its source or how it was produced.

The "natural" or "vitamin C complex" supplements are derived from plant sources, and they also contain other antioxidants, such as bioflavonoids. Such supplements are good products, as the more antioxidants the patient ingests, the better. However, such multi-ingredient products end up being unnecessarily expensive to the consumer seeking optimal value for their money. To receive the optimal recommended amounts of vitamin C, such supplements can be quite costly. Nevertheless, many patients who have never supplemented before will find that they feel substantially better on even relatively small amounts of vitamin C, regardless of the source or the type of vitamin C-containing supplement being taken.

**...studies have shown that vitamin C can not only enhance the anti-cancer effects of chemotherapy but also mitigate its negative impact on normal cells.**

Buyer beware. While the internet is invaluable in delivering information, many charlatans utilize the same platform to defraud potential customers. As such, the discerning healthcare consumer must evaluate what is beneficial, what is harmful, and what is merely inconsequential. The individual needs to double-check and triple-check information on other websites and information sources to help establish the truth.

### *Vitamin C and Synergistic Therapies*

Because it is a powerful antioxidant that is well-distributed throughout the body, vitamin C can enhance the effectiveness of nearly all other therapeutic agents and interventions. For infections, vitamin C also works well with most antibiotic regimens that the clinician might prescribe.

With the application of ozone, which initially exerts a pro-oxidant effect on pathogens in the blood and tissues, vitamin C is well-suited for administration following such treatments. Generally, vitamin C should not be used simultaneously with a pro-oxidant agent, as the oxidizing effect of such an agent is initially desirable in a given situation, and vitamin C could neutralize it before it has had sufficient impact.

Chemotherapeutic agents, which are nearly all pro-oxidant and toxic, can be neutralized to a degree when given ***simultaneously*** with vitamin C. If the maximal oxidizing impact of the chemotherapy is desired, then it should not be in the bloodstream at the same time as the vitamin C. However, no significant delay is needed to follow chemotherapy with vitamin C, as it works very well in repairing the damage done to the normal, non-cancerous tissues. A similar protection from vitamin C, which shields normal cells from the toxicity of chemotherapy, can also be achieved if it is administered before chemotherapy. Consistent with these concepts, studies have shown that vitamin C can not only enhance the anti-cancer effects of chemotherapy but also mitigate its negative impact on normal cells.[99-102]

## *Multi-C Protocol*

There is no one optimal way to administer vitamin C to a given patient. As the most critical factor in vitamin C therapy is the dose, it follows that a patient does best when vitamin C levels inside the body's cells are eventually optimized. While there is no single set way to best achieve this goal, administering two or more forms of vitamin C can be more effective than pushing a single form of administration to its maximum degree. The Multi-C Protocol is a valuable guide for determining the best ways to optimize vitamin C levels in patients undergoing treatment. This protocol can utilize vitamin C administration in any of the following ways:

- ✓ Oral liposome-encapsulated vitamin C, which works to optimize the intracellular delivery of vitamin C, as well as delivery to subcellular organelles, like the mitochondria
- ✓ Oral ascorbic acid or sodium ascorbate powder, taken in multigram doses several times daily, up to or reaching bowel tolerance. This minimizes exposure to gut-generated toxins, helps load the numerous immune cells in the gut with vitamin C, and supports the extracellular delivery of vitamin C.[103-104]
- ✓ Oral administration of ascorbyl palmitate, a fat-soluble form of vitamin C, improves antioxidant status in fatty tissue and nervous system tissues, including the cell walls.[105-108]
- ✓ Intravenous administration of vitamin C is available as IV push, rapid infusions, and prolonged infusions. This optimizes toxin neutralization in the extracellular areas of the body before most of the vitamin C is eventually taken into the cells. The periodic addition of IV vitamin C pushes can also enhance extended infusions of vitamin C, further increasing circulating vitamin C levels in the blood. In a hospitalized situation, if permitted, 24-hour infusions of vitamin C can also be administered. Adding insulin, hydrocortisone, and/or magnesium will substantially augment the intracellular delivery of vitamin C.
- ✓ Intramuscular administration of vitamin C is utilized when IV is not easily achieved, as in the very young.
- ✓ Hydroxytyrosol (significantly present in olive leaf extract) supplementation helps overcome the epigenetic defect in the human liver that blocks the internal synthesis of vitamin C.[109]

- ✓ Metadichol® is a dietary supplement described as a nano lipid formulation of policosanol. A 5 mg daily dose has been reported to increase vitamin C levels between 3- and 12-fold. The impact of policosanol supplementation on vitamin C levels in its regular form is not yet known. Metadichol® has also been reported to have a potent antiviral impact *in vivo*. In mouse fat cells, it has been reported to increase the expression of the GULO gene in the liver 4-fold.[110-114]

## Mop-Up IVC

Some individuals, especially those with more severe conditions, such as acute and chronic infections, as well as substantial toxin accumulations in their bodies, may begin to feel unwell late during an infusion of vitamin C. While it is much more typical to generally feel better as the infusion proceeds, a few individuals may feel worse as an increased toxin presence appears in the bloodstream. This response to the infusion has been referred to as a Herxheimer reaction, or a Herxheimer-like reaction. Over 100 years ago, syphilis patients given an effective anti-pathogen would often get quite ill when the pathogens would die off and leave behind toxic metabolites in the blood. This phenomenon was described by two dermatologists, Karl Herxheimer and Adolf Jarisch.

With IVC, a similar reaction can occur, but it is not severe, as vitamin C is the most direct way to deal with the presence of new toxins in the blood. The common clinical situations for the Herxheimer reaction to occur late in an IVC or immediately following it are:

- ✓ **Massive kill-off of pathogens**: This occurs when an infection is susceptible to the anti-pathogen effects of vitamin C, resulting in a rapid kill-off of the pathogens. As a consequence, a relatively large amount of toxic pathogen-related debris appears

in the blood, along with highly toxic free iron contained within such pathogens. This reaction is very similar to the circumstances present when syphilis was being effectively treated, as noted above.

- ✓ **Accelerated release of stored intracellular toxins**: Some patients, particularly older individuals, have accumulated large stores of toxins within their cells. Such cells exhibit significantly increased intracellular oxidative stress, accompanied by a substantial reduction in their detoxification abilities, as many of the detoxification enzymes are in an inactive, oxidized state. When a high enough dose of vitamin C can enter these cells in a relatively short period, these detox enzymes are reactivated (reduced) and begin releasing the stored toxins from the cells into the blood and lymphatic circulation. When these toxins are being released from these cells in large enough amounts, the new incoming vitamin C cannot neutralize them rapidly enough to keep the patient symptom-free.
- ✓ **Massive kill-off of susceptible cancer cells**: Cancer patients can also have a clinical response to IVC very analogous to that of an infection, as noted above. Some types of cancer are much more susceptible to vitamin C treatment than others, and some cancers have a much larger mass of cancer cells than others. When the cancer is highly sensitive to IVC and has a large mass, a Herxheimer-like reaction can occur as a result of the large-scale killing of cancer cells, releasing substantial amounts of uric acid, phosphate, and potassium.[115] Additionally, as with infections, cancer cells

> contain large amounts of free iron that are also released when they die. Of note, many cancer patients have infections as well, which would further add to the degree of the Herxheimer response as both pathogens and cancer cells are killed and broken apart.

The Mop-Up vitamin C infusion is paradoxical on its face. The same agent that causes the detoxification problem is utilized to resolve it. The "trick" is in the amount of vitamin C that is infused and the rate at which it is infused. Vitamin C is the ultimate antitoxin; however, when it is administered too rapidly in large doses, especially to the patient groups described above, a significant outpouring of toxins can result, exceeding the neutralization capacity of the newly administered vitamin C.

**Another benefit of Mop-Up vitamin C is that it allows healthcare practitioners to administer higher vitamin C doses than might have been possible otherwise, which is a generally desirable goal for most patients.**

The Mop-Up vitamin C principle is "Low & Slow." When the Mop-Up phase becomes necessary, vitamin C, administered at a much lower dose and more slowly, will proceed to neutralize the circulating toxins while having little to no impact on releasing additional toxins from the cells. Determining the optimal amount of vitamin C required and the rate at which it should be administered ultimately becomes a clinical decision. Sometimes, simply slowing the infusion rate by 75% or so, when 25% to 50% of the IV fluid remains, is enough to have the patient feeling well by the end of the infusion period. When the patient feels poorly and the primary IV is almost complete, just infusing five more grams over an hour or so can satisfactorily resolve the detox reaction.

Another benefit of Mop-Up vitamin C is that it allows healthcare practitioners to administer higher vitamin C doses than might have been possible otherwise, which is a generally desirable goal for most patients. As long as a patient feels good by the time they leave the office, they will typically be happy to return for more treatment in the future, even if they were somewhat symptomatic toward the end of the initial infusion. Additionally, repeated infusions are expected to have a significantly lower chance of a detox reaction, as toxin levels in the body decrease over time.

## Vitamin C's Incredible Safety

Virtually all therapeutic agents can be pushed to a toxic degree of intake. Because the amounts needed to reach toxicity can sometimes be ludicrously high, most natural agents, nutrients, vitamins, and minerals can be regarded as having no significant toxicity concerns, especially when taken as recommended. Even excessive water intake can be fatal.[116-118] However, most prescription drugs have far lower thresholds to reach a toxic intake, with many deaths occurring even when such drugs are taken ***precisely as prescribed***.

Vitamin C has never been shown to have a defined toxicity in humans. In rats, the median lethal dose (LD50) of vitamin C is approximately 11,900 mg/kg when administered orally. This represents an oral intake of greater than 800 grams in a 70 kg person, a dose that could never really be reached by anyone due to bowel intolerance. This lack of toxicity is underscored by the fact that the highest blood levels of vitamin C are associated with the lowest mortality from heart disease and cancer, in particular, as well as mortality from all causes. In 19,496 men and women, vitamin C levels in the top 20% of this group were associated with half the risk of dying compared to those individuals with vitamin C levels in the bottom 20%.[119-120]

The experience at the Riordan Clinic in Wichita, Kansas, strongly supports the unique safety of vitamin C. Over the past 33

years, over 175,000 intravenous infusions of vitamin C have been administered at the Riordan facilities. Doses have varied from 7.5 grams (as a slow IV push) to 250 grams daily, with 50 grams being the most common dose administered. NO significant adverse side effects were seen. Furthermore, many of the patients were not "well" patients looking for a vitamin boost. Rather, many had chronic degenerative diseases, including cancer, and would be expected to be more prone to side effects from any treatment they might receive. In 24 terminal cancer patients, continuous infusions of vitamin C at approximately 50 grams per day for eight weeks resulted in no definable adverse side effects. However, one patient with a previous history of kidney stones developed a stone.[121-122]

**This lack of toxicity is underscored by the fact that the highest blood levels of vitamin C are associated with the lowest mortality from heart disease and cancer, in particular, as well as mortality from all causes.**

Also from the Riordan Clinic, it was reported more specifically that "…194,054 grams, or 427 pounds of IV vitamin C" were "administered to 275 patients with no sign of kidney disease, or any other significant side effects over 16 years."[123] In Australia, it was reported that many (roughly 100) physicians had given as much as 300 grams of vitamin C intravenously to their patients without any significant side effects and often spectacular clinical results.[124]

A sizable number of integrative medicine practitioners appreciate the therapeutic value of IVC but continue to be unnecessarily wary of 50- to 100-gram infusions of vitamin C (or even higher doses). This unnecessary caution too often results in a total daily dose of 25 grams or less that can sometimes prove to be insufficient to save a patient with severe and widespread oxidative stress and damage secondary to an advanced infection or other medical condi-

tion. Nevertheless, even such lower doses can still often be very effective, and even curative, just not as reliably so. As the efficacy and safety of vitamin C have been increasingly witnessed and documented during the COVID pandemic, the medical propaganda seeking to discredit the value of this agent has only increased, and the myth of "vitamin C toxicity" continues to be pushed.

## *Vitamin C and Kidney Stones*

The most persistent myth about high doses of vitamin C is that it precipitates kidney stones. Most kidney stones are composed of calcium oxalate. As such, it should become immediately apparent that an elevated presence of calcium, as well as oxalate, will be needed to result in the formation of most stones. However, while the presence of increased oxalates from vitamin C in the urine does not reliably cause kidney stones, it is one of multiple risk factors. At least 60 other risk factors for increased urinary oxalate have been identified.[125]

In the large-scale Harvard Prospective Health Professional Follow-Up Study, individuals with the highest daily vitamin C intake (in the top 20%) had a ***lower*** risk of kidney stones compared to those with the lowest intake (in the bottom 20%).[126] In over 10,000 patients, where serum vitamin C levels were examined to correlate with the presence of kidney stones, higher levels of vitamin C were ***not*** found to increase the prevalence of kidney stones. In fact, among men, a 1 mg/dL increase in serum ascorbic acid was independently associated with a nearly 30% ***decrease*** in the prevalence of kidney stones.[127] Conversely, in examining a large population of men who had already developed kidney stones, no association was found between the intake of vitamin C and stone formation.[128] A similar study in women reached the same conclusions.[129]

In a guinea pig study (an animal that does not produce vitamin C), it was demonstrated that the administration of vitamin C alone did not induce the production of calcium crystals

or stone formation. However, when vitamin C administration was preceded by 45 days of feeding the animal calcium carbonate and an ***additional*** source of oxalate (sodium oxalate), which resulted in elevated levels of both calcium and oxalate in the urine, calcifications occurred.[130]

**In the large-scale Harvard Prospective Health Professional Follow-Up Study, individuals with the highest daily vitamin C intake (in the top 20%) had a *lower* risk of kidney stones compared to those with the lowest intake (in the bottom 20%).**

Other factors are involved in calcium oxalate kidney stone formation aside from elevated calcium and oxalate levels in the urine. While someone can develop a kidney stone during or following a vitamin C infusion, it is nevertheless extremely rare. It should not be a deterrent to giving vitamin C when it is clinically indicated. Pregnancy is not an established risk factor for kidney stones in normal women; however, it substantially increases the amount of calcium and oxalate excreted in the urine, both of which are individual risk factors for stone production.[131]

While oxalate is a terminal breakdown product of vitamin C, there are additional stages of breakdown leading up to that:[132]

- ✓ Ascorbic acid (AA) to dehydroascorbic acid (DHAA)
- ✓ DHAA to diketoglutaric acid
- ✓ Diketoglulonic acid to lyxonic acid, xylose, threonic acid, or oxalic acid (oxalate)

Also, it appears that oxalate excretion ***levels off*** as more vitamin C is administered, and the rest of the vitamin C and its other breakdown products that do not get assimilated by the body are excreted unchanged in the urine.[133] Researchers found that ***roughly***

***80%*** of vitamin C administered to human subjects was eliminated in the urine as DHAA, ***never reaching further breakdown products***.[134] Logically, the degree of breakdown of vitamin C to oxalate relates to the degree of oxidative stress already present in the bloodstream, with higher levels of oxalate seen when greater oxidative stress is present.

**Furthermore, multiple studies have shown that vitamin C is *not* a reliable cause of kidney stones, *even in patients with a pre-existing history of kidney stones*.**

Increased oxalate alone will not cause stone formation in a patient with normal kidney function.[135-137] As with all medicines or nutrients that can be ingested, significantly decreased kidney function is always a trigger to be more cautious with the dosing of any agent and to be aware of the early signs of problems. Furthermore, multiple studies have shown that vitamin C is ***not*** a reliable cause of kidney stones, ***even in patients with a pre-existing history of kidney stones***.[138-140] In one striking case history, an 81-year-old woman presented with a large staghorn stone formation in her right kidney. She refused surgical intervention and opted for the administration of vitamin C along with a combination of antibiotics and diuretics. After eight weeks, the stone had completely ***dissolved***.[141]

The dissolution of urinary tract stones by vitamin C has also been documented in dogs. A 10-year-old terrier was found to have bladder stones. The owner declined surgery and administered 500 mg of vitamin C daily to the dog. Six months later, the dog had an unrelated uterine surgery, and examination of the bladder at the time of surgery revealed that the stone had dissolved. In a similar case, a veterinarian dissolved a large bladder stone after receiving 8,000 mg of ascorbic acid daily for four months.[142]

Excess urinary calcium is the primary cause of kidney stones, and the presence of high oxalate levels further contributes to the formation of stones.[143] Also, excessive dairy and calcium supplementation should be strictly avoided for optimal health, even when kidney stones are not a concern for each patient.[144] If there is no excess calcium present in the urine, it is almost impossible to develop a kidney stone regardless of the oxalate level in the urine. Low serum magnesium levels also increase stone formation, even when in the lower range of "normal."[145-147] In a review that attempted to cover papers representing points of view that suggested or concluded that vitamin C would precipitate kidney stones, the conclusion reached was that large doses of vitamin C would not cause stones or iron overload, another popular myth that has concerned many vitamin C supplement users.[148]

When considering the effects of vitamin C on kidney function and stone formation, it is essential to remember that any disease is a unique arrangement of excessive oxidized biomolecules, as described in Chapter 1. This also applies to kidney disease and the formation of stones.[149] Oxidative stress is also quantified with the oxidative balance score (OBS).[150] The higher the score, the less bodywide oxidative stress or bodywide inflammation is present. Lower scores have been associated with an increased risk of kidney stones.[151]

When oxidative stress is more focal, it is characterized by focal inflammation. Such focal inflamed sites within an area of kidney cells serve as starting points for stone formation.[152] In animal studies, antioxidants (anti-inflammatory) agents have been shown to inhibit kidney stone formation.[153-155] Anecdotal reports have suggested that a protocol of IVC administrations can be used to ***treat*** kidney disease, resulting in a clear reduction of elevated creatinine levels. The role of oxidative stress in all diseases, including those affecting the kidney, must always be considered. An appropriate regimen of vitamin C administration, combined with the elimination of many of the other factors that contribute to stone

formation, can prove to be the optimal treatment and should not be avoided.

## *Vitamin C and G6PD Deficiency*

G6PD (glucose-6-phosphate dehydrogenase) is an intracellular enzyme that promotes energy production inside the cell. When it is deficient in the red blood cell (RBC), oxidative stress is increased, and further oxidative insults can ultimately increase the oxidative stress to the point of RBC rupture. When enough RBCs rupture, a secondary anemia (hemolytic) results. Notably, ***any factor*** that triggers a significant increase in oxidative stress in the blood can precipitate RBC rupture in a G6PD-deficient patient.[156]

Vitamin C would only be expected to be one possible cause of RBC rupture when it results in a new and substantial pro-oxidant (toxin) presence in the blood from one of the three sources described above in the Mop-Up vitamin C section.[157-158] Similar to the rationale explained in the Mop-Up section, the RBCs in a G6PD patient can either be stabilized with antioxidants before an IVC infusion, or much smaller doses of vitamin C can clear out the pro-oxidant agents in the blood that can continue to provoke the hemolysis, as is done with a Mop-Up vitamin C infusion.[159] In a review of 32 articles, nine common herbal or dietary supplements were found to be safe in G6PD-deficient individuals. This included vitamin C, vitamin E, vitamin K, ginkgo biloba, and alpha-lipoic acid.[160]

Although relatively rare among Caucasians, G6PD deficiency is the most common human genetic enzyme defect, affecting more than 400 million people worldwide. As an X-linked disorder, this defect is more common in men than women. It is most prevalent in Africa, Asia, the Middle East, Latin America, and the Mediterranean. However, current immigration patterns make it essential for clinicians to be aware that this defect is becoming increasingly prevalent in countries where it was previously scarce.[161-164]

Not surprisingly, RBCs with a deficiency of G6PD can rupture even more readily when another condition, often an infection, has already significantly increased the level of oxidative stress inside the body before any additional oxidative stress is introduced to the blood.[165-167]

A special note is warranted regarding G6PD-deficient patients who develop the relatively rare condition known as methemoglobinemia. In patients without G6PD deficiency, this condition can be effectively treated with either methylene blue or vitamin C. However, when the enzyme deficiency is present, methylene blue is relatively ***contraindicated***, and properly dosed vitamin C is needed.[168-170]

There are multiple ways to fortify G6PD-deficient RBCs against rupture by new pro-oxidants in the blood, including those that might be expressed in some patients secondary to an IVC infusion. The goal is twofold:

- ✓ To lessen the amount of intracellular oxidative stress in the RBC
- ✓ To protect the RBC cell membrane from new oxidative damage

Different ways to help achieve this RBC fortification and prevent hemolysis when blood testing reveals a G6PD deficiency include the following:

- ✓ The administration of ascorbyl palmitate for several days, as this fat-soluble form of vitamin C, directly protects against oxidative damage to the RBC cell membrane. Alpha tocopherol is also protective.[171]
- ✓ A low-dose (several grams daily) protocol of oral vitamin C for several days to weeks
- ✓ An IVC protocol that starts with 1 to 5 grams of vitamin C and increases gradually each day to the administration of the final desired dose of vitamin C

- ✓ The administration of other antioxidants, such as quercetin[172-173]

A protocol for dealing with hemolysis that has already begun:

- ✓ The patient should report immediately if the urine becomes even slightly darker than usual during the infusion. As VC has a diuretic effect, the urine should always be the same color or even lighter in tone. Damage to the kidneys only occurs when the hemolysis remains undetected and the aggravating factors are continued.
- ✓ Stop the infusion and then reinitiate VC according to the principles of the Mop-Up protocol described above.
- ✓ Additional VC should be given in normal saline or lactated Ringer's solution to maximize volume expansion in the blood and increase the volume of urine flow.
- ✓ Administer 20 to 40 mg of furosemide IV if available, or orally, to further increase urine flow.

Currently, blood donors are not routinely screened for G6PD deficiency. While giving G6PD blood would not be expected to routinely cause any problems in the recipient, patients with conditions resulting in increased systemic oxidative stress would be best managed like those receiving IVC.[174-175]

## Vitamin C and Immunosuppressive Drugs

Because vitamin C has been recognized as an agent that strengthens the immune system, vitamin C is needlessly underdosed or entirely avoided in patients taking immunosuppressive drugs for several conditions and diseases, including patients who have received organ transplants or bone marrow stem cell transplants. The rationale is that the immune system is attacking the transplant,

and the "stronger" the immune system is, the more effective the rejection will be.

The problem with this reasoning is that transplant rejection is like all other pathologies, meaning that it is secondary to ***increased oxidative stress*** at the site of the transplant.[176] Synthetic corticosteroids, like prednisone, are included in most immunosuppressive regimens. As will be discussed at length elsewhere, ***the primary benefit of prescription steroids is that they reduce oxidative stress (inflammation) by facilitating the uptake of vitamin C into the cells most affected***. The effectiveness of steroids in the long term for transplant patients depends on the amount of vitamin C being taken and the availability of vitamin C to be transported into the cells. When extracellular vitamin C levels remain low, the steroids provide only undesirable side effects and little to no benefit. Most prominently, due to the gluconeogenesis that they stimulate, glucose levels rise, and muscle wasting increases along with the formation of new glucose. Furthermore, the array of other immunosuppressive drugs used in transplant patients is generally pro-oxidant in nature, which also works to keep vitamin C levels depleted where they are needed most.

***...the primary benefit of prescription steroids is that they reduce oxidative stress (inflammation) by facilitating the uptake of vitamin C into the cells most affected.***

It has never been shown that vitamin C stimulates or promotes the rejection of transplants—quite the opposite. IVC, later followed by a regimen of oral vitamin C, has been shown to improve overall survival in patients receiving bone marrow transplants.[177] In animal studies, vitamin C, along with vitamin E, has been shown to prolong heart transplant survival.[178-179] A vitamin E antioxidant derivative has also been shown to decrease heart transplant rejection and increase

survival times.[180] Vitamin C has also been shown to improve the defense provided by white blood cells in kidney transplant patients.[181]

In heart transplant patients, accelerated coronary arteriosclerosis is a leading cause of death.[182-183] In human and animal studies, vitamins C and E have been shown to slow the development of this arteriosclerosis and increase survival times.[184-187]

It appears, then, that vitamin C is never contraindicated in organ or stem cell transplants. Rather, vitamin C is indicated for conditions with established increased oxidative stress, which can cause the disease or pathology. While optimal doses have not been established, vitamin C dosing in transplant patients is just as appropriate as for any other condition.

## Recap

After the discovery of vitamin C by Dr. Albert Szent-Gyorgyi, Dr. Frederick Klenner led the way in demonstrating its extraordinary clinical power in resolving infections and neutralizing toxins. A handful of prominent scientists and clinicians have continued to lead the way in using and promoting vitamin C, following Dr. Klenner's introduction of it to the medical world.

A sampling of the extensive research documenting the benefits of vitamin C in treating patients is provided. A practical section on administering vitamin C properly is also provided.

The exceptional safety of vitamin C is well-documented in the literature. Myths asserting that vitamin C causes kidney stones and renal toxicity are debunked. G6PD deficiency and the potential of RBC breakdown with IVC are addressed in detail as a factor in selected individuals, as well as ways to readily overcome it or to deal with it as it occurs. The myth that vitamin C might be harmful to patients with organ or bone marrow transplants is also dispelled.

## Chapter 13

*It is difficult to get a man to understand something when his salary depends upon his not understanding it.*

Upton Sinclair

# Magnesium: The Most Vital Supplement

## Most Adults Have a Magnesium Deficiency

In Chapter 3, excess cellular calcium was identified as the primary reason for increased intracellular oxidative stress, which determines whether a cell is sick and part of a disease process. Magnesium is the ***natural antidote*** to this, effectively pushing calcium out of the cell as magnesium goes in. Since the persistence of this state of excess intracellular calcium prevents ***any*** significant improvement to a disease or medical condition, magnesium emerges as the ***most critical supplement***. While you would not want magnesium to be your only supplement, no other supplement can have the clinical impact of magnesium in lowering excess intracellular calcium and minimizing its damaging impact. Even though supplementing vitamin C is very critical to achieving optimal

health, it cannot overcome the adverse effects of a significant magnesium deficiency. In contrast, a high intake of other antioxidants can ***minimally*** compensate for a lack of vitamin C supplementation. Only magnesium can correct a magnesium deficiency, and individuals with increased intracellular calcium levels always have depressed total magnesium levels in their bodies and cells.

> **While an advanced magnesium deficiency is the primary cause of some diseases, any degree of magnesium deficiency *makes all diseases worse* and more challenging to manage.**

And the greater the deficiency, the more profound the negative clinical impact. Furthermore, virtually the entire adult population is magnesium deficient, with a large percentage of that population severely deficient. A more detailed analysis of the physiology of magnesium and its wide-ranging clinical effects is addressed elsewhere.[1-2]

**While an advanced magnesium deficiency is the primary cause of some diseases, any degree of magnesium deficiency *makes all diseases worse* and more challenging to manage.**

## Magnesium Physiology

Magnesium is the fourth most common cation (positively charged ion) in the body, behind only sodium, potassium, and calcium, and it is the second most abundant cation inside the cell, after potassium.[3] Over 99% of the magnesium in the body is located inside the cells, primarily concentrated inside the mitochondria.[4] It also works as a cofactor in roughly 600 enzymatic reactions and an activator of about another 200 enzymatic reactions in the body. These reactions include many that involve

energy metabolism and the production of adenosine triphosphate (ATP).[5-6] ATP is the predominant energy-delivering molecule in the body, with many critical chemical reactions dependent on it to take place.

The most important function of magnesium is that it acts as the primary natural calcium channel blocker in the body, working to help lower and normalize the elevated intracellular calcium levels seen in all diseases. Arguably, this function of magnesium accounts for nearly all its positive clinical effects throughout the body. Some authors also maintain that magnesium and calcium are natural biological antagonists. However, it is not clear that the nature of this antagonism extends beyond the ability of magnesium to function as a calcium channel blocker.[7]

The calcium channels are proteins that traverse the cell membrane and function to regulate the influx of ionic calcium. Magnesium is so effective in limiting cellular uptake of calcium that a high enough presence of it can eventually result in a calcium-depleted cell. However, this is not achievable with any degree of oral supplementation. Magnesium toxicity, as can occur with excessive magnesium administered ***intravenously***, is the result of an excessive depletion of cellular calcium, especially in the smooth muscle in the arterial walls. This results in various degrees of hypotension, as sufficient calcium is necessary for normal arterial muscular tone.

In addition to its clear impact on arterial muscular tone and blood pressure, magnesium has many other clinical effects. It appears that all of them are due to the reduction of calcium levels inside the cells most impacted by a given disease.[8] The lowering of intracellular calcium levels by magnesium readily accounts for its ability to effectively treat and/or prevent many significant medical conditions, including the following that are primarily due to magnesium deficiency

- ✓ Pre-eclampsia and eclampsia during pregnancy[9]

- ✓ Cardiac arrhythmias and sudden death[10-11]
- ✓ Seizures[12]
- ✓ Migraine[13]

Many other conditions are ***fueled and accelerated*** by chronic magnesium deficiencies, as would be expected with a substance that decreases oxidative stress in every cell. Such conditions include the following:[14-19]

- ✓ Heart disease mortality[20]
- ✓ Hypertension
- ✓ Stroke
- ✓ Atherosclerosis
- ✓ Cancer
- ✓ Asthma, especially acute
- ✓ Stone formation and dissolution of existing stones[21]
- ✓ Diabetes and/or glucose intolerance and insulin resistance
- ✓ Metabolic syndrome
- ✓ Endothelial dysfunction
- ✓ Abnormal lipid metabolism
- ✓ Platelet aggregation and blood clotting (thrombosis)
- ✓ Inflammation in general
- ✓ Increased oxidative stress in general
- ✓ Chronic fatigue
- ✓ Depression and neuropsychiatric disorders
- ✓ Recurrent bacterial and fungal infections
- ✓ Impotence
- ✓ Tooth cavities
- ✓ Kidney and liver disease
- ✓ Glaucoma
- ✓ Alzheimer's disease, multiple sclerosis, neurological disorders in general[22-23]

## Cellular Electrical Disorders

### Heart Cells and Arrhythmias

Numerous research studies have shown that low magnesium levels significantly increase the likelihood of abnormally generated (ectopic) atrial and ventricular contractions, which can then progress into runs of abnormal beats (arrhythmias). As very little of the magnesium content in the body is outside of the cells or in the blood (1% or less), even normal blood levels of magnesium do not rule out significant intracellular magnesium deficiencies. However, it is also necessary to recognize that lower blood levels of magnesium ***always*** indicate advanced cellular magnesium depletion.

**Over 99% of the magnesium in the body is located inside the cells, primarily concentrated inside the mitochondria.**

Many studies have shown that magnesium suppresses ventricular ectopy, ***regardless of serum magnesium levels***, which is consistent with the fact that many patients have low intracellular magnesium levels, even when their serum magnesium levels are normal.[24-26] When specifically studied, it has been found that increased ventricular ectopy correlates with lower intracellular magnesium levels.[27]

Multiple studies have consistently demonstrated the straightforward relationship between low magnesium levels and increased supraventricular (atrial) arrhythmias. Additionally, low dietary magnesium intake has been linked to an increased incidence of atrial ectopy.[28] Conversely, magnesium administration is effective in treating atrial arrhythmias.[29] Similarly, magnesium deficiency increases the incidence of ventricular ectopy, while oral magnesium intake decreases the incidence.[30-31]

When the heart conduction cells become sufficiently depleted of magnesium, electrical instability ***reliably*** ensues, and the

presence of ectopic beats, singularly or in rapid runs (tachyarrhythmias), ***will eventually occur***. And when the ectopic beats are of ventricular origin, the rapid runs (ventricular tachycardia) can readily deteriorate into ventricular fibrillation and sudden death. While many different factors can increase the chances of abnormal heart rhythms occurring, it is important to realize the following:

> **The ectopic beats that characterize arrhythmias *will not occur in the face of a completely normal level of magnesium inside the mitochondria in the heart cells.***

Factors such as alcohol, caffeine, and circulating toxins will readily provoke arrhythmias in myocardial cells already sufficiently depleted of magnesium. Heavy alcohol intake is often associated with a low blood level of magnesium and a prolonged QT interval on electrocardiogram.[32] However, they are not factors ***independently*** capable of stimulating ectopy when cellular magnesium is normal. Notably, some of these factors can also contribute to the loss of magnesium from the body, thereby further supporting the low intracellular magnesium levels that ultimately result in electrically unstable heart cells.

Multiple studies have demonstrated that the administration of intravenous magnesium reduces arrhythmias and mortality in patients with myocardial infarction.[33-35] In general, hypomagnesemia is associated with and promotes arrhythmias. The intravenous administration of magnesium can quickly control arrhythmias and restore a normal rhythm, depending partially on the patient's overall clinical status and any other arrhythmia-provocative factors that may be present.[36-39]

The only time that ectopic beats and arrhythmias can be generated in a heart with normal intracellular magnesium levels is when the heart is not entirely normal structurally. When inherited or acquired abnormal conduction pathways are present or when heart chamber dimensions are sufficiently abnormal (e.g., an enlarged left

atrium), low cellular magnesium levels might no longer be required for an arrhythmia to emerge. Nevertheless, even in such structurally compromised hearts, normal intracellular magnesium levels can still greatly minimize the total quantity of extra beats and diminish the propensity to develop life-threatening arrhythmias.

**Multiple studies have demonstrated that the administration of intravenous magnesium reduces arrhythmias and mortality in patients with myocardial infarction.**

A powerful cofactor in patients with depressed intracellular magnesium levels that sets the stage for easy arrhythmia provocation is a low blood potassium level. The laboratory reference range (typically regarded as the normal range) for blood potassium extends from 3.5 to 5.2 mmol/L. However, 4.0 mmol/L is much closer to the real lower limit of normal for blood potassium. Coronary care unit patients with potassium levels of about 3.6 had an increased risk of ventricular fibrillation compared to those with levels of about 3.9.[40]

Hypokalemia (low blood potassium), as well as hypomagnesemia, is often seen in patients on chronic diuretic therapy.[41] And even when diuretics are not being taken, hypokalemia is not uncommon.[42] In patients with acute myocardial infarction, hypokalemia was seen in 17% of this group.[43] Regular supplementation with potassium would result in a substantial decline in significant arrhythmias, especially in conjunction with proper magnesium supplementation.[44] A serum potassium of 4.0 or greater, along with heart cells having a normal intracellular magnesium level, should make it impossible for ectopic beats or arrhythmia to occur.

**Except when structural abnormalities are present in the heart, all arrhythmias should *resolve* completely when magnesium levels have been normalized *inside* the heart cells and blood potassium levels are normal**

**(4.0 mmol/L or more). Atrial fibrillation would no longer exist, much less be as common as it is today. The absence of extra beats on a 24-hour recording of the heartbeats (Holter monitor) is essential to knowing whether the intracellular magnesium status is sufficiently normal.**

The QT interval is the period of electrical repolarization (a "resetting" of the heart cells that just contracted) following the rapid depolarization (QRS) seen on the electrocardiogram. The QRS is the manifestation of the electrical "spark" that results in a contraction of the heart muscle. When the QT interval is prolonged, the stage is set for the appearance of different arrhythmias, some of which can be rapidly fatal if not promptly identified and correctly treated.[45] Many other drugs can prolong the QT interval, and it is not uncommon for overdose patients to die suddenly of a ventricular arrhythmia that evolves into ventricular fibrillation, known as torsade de pointes (polymorphic ventricular tachycardia).[46-48] Intracellular magnesium levels have been shown to be inversely related to the QT interval, which strongly highlights the importance of magnesium administration in preventing and/or treating QT prolongation-related arrhythmias.[49] In dialysis patients, magnesium supplementation has been shown to help reduce prolonged QT intervals.[50] Both infusions of magnesium and rapid IV bolus magnesium administration can shorten prolonged QT intervals.

## COVID Spike Protein and Sudden Death

The spike protein is addressed in detail in Chapter 4. Arrhythmias have gained a new notoriety since the introduction of the COVID spike protein into the body from COVID infection and/or from COVID shots. From 2021 through 2023, over 2,000 otherwise healthy and young athletes, mostly European, were reported to have collapsed on their playing fields from sudden

cardiac arrest. Over 1,400 of them died. This did not happen at all before 2021 ( COVID-19 vaccines were first administered at different times in 2020). One professional soccer player noted that he had played in approximately 500 games over 20 years, and that not a single cardiac-related collapse had occurred among the athletes or spectators. This indicates that an individual can appear completely healthy while having a spike protein-compromised heart that can progress at any time to a fatal arrhythmia. (See: https://goodsciencing.com/uncategorized/athletes-suffer-cardiac-arrest-die-after-covid-shot/)

**Except when structural abnormalities are present in the heart, all arrhythmias should *resolve* completely when magnesium levels have been normalized *inside* the heart cells and blood potassium levels are normal...**

Along with other toxins, such as heavy metals that are readily taken up by the heart muscle, the persistent presence of spike protein makes the heart especially prone to arrhythmia. The high metabolic activity of the heart results in the assimilation of whatever is in the blood, whether a nutrient or a toxin, much more effectively than any other organ. Autopsy studies have identified spike protein in the heart tissue of 60% of patients who died from COVID.[51] And many of the autopsies would have missed the presence of spike protein in COVID hearts, as the number of heart cells affected in a COVID patient can be extraordinarily ***focal and minimal*** in number, leaving the bulk of the heart tissue uninvolved.[52] This steady and greater accumulation of toxins, especially heavy metals, in the heart is likely the primary reason that spike protein seems to "target" the heart more than any other tissue or organ in the body. The existing toxin load in the heart keeps the affected heart cells in a greater state of baseline inflammation than any other organ or tissue in the body. With this added state of background inflammation, a given additional

toxin exposure in the form of circulating spike protein will ***appear*** to favor attacking the heart. However, any organ or tissue already inflamed will more easily be provoked into an overtly diseased state than any organ or tissue with lesser amounts of spike protein and other accumulated toxins.

**Modern food processing has depleted magnesium content by roughly 80% to 90%.**

Because of the increasingly common spike protein presence in the population, it is critical to follow specific diagnostic and therapeutic protocols to prevent the possibility of sudden death due to persistent spike protein (PSP) in chronic COVID or post-COVID shot patients. Furthermore, specific measures should be taken for any patient presenting with any symptom, unless it is ***clearly*** unrelated to COVID infections or vaccinations.

Myocarditis has now been documented to occur quite frequently in patients with PSP. It has also been reported to occur in a substantial number of patients with PSP who have been vaccinated and have never contracted COVID-19.[53-56] Certainly, myocarditis should not be regarded as a rare consequence of COVID shots and boosters. A study in mice showed that the injection of the mRNA vaccine (which produces the spike protein) reliably induced myopericarditis.[57] Regardless of the initial source of exposure to spike protein, it is the primary reason for the pathology and symptoms seen in chronic COVID.[58] However, the COVID shots and their boosters typically result in much higher persistent spike protein levels than are seen in chronic COVID patients who had never received a shot.

## Nerve Cells and Seizures

Like a heart conduction cell that actively participates in generating and conducting the electrical discharge that causes the

heart muscle to contract, neurons have a similar pathophysiology in generating an abnormal electrical discharge, which ultimately results in a seizure. The "flow" of calcium, potassium, and magnesium is the leading player in determining the electrical stability of both the heart conduction cell and the nerve cell. While all the biochemical mechanisms remain to be established, the movements and accumulations of calcium in the neurons are the basic factors that dictate cell health, along with the propensity to electrical instability and seizures.[59]

Generally, the more calcium that accumulates in these cells, the less electrical stability is present.[60] In neurons participating in prolonged seizure activity (status epilepticus), the high cellular calcium levels can also directly lead to selective neuronal death.[61] Even in patients on recommended anti-seizure drug therapy, it has been shown that intravenous magnesium can promptly terminate seizure activity and accelerate complete clinical recovery.[62] However, the inhibition of normal intracellular calcium movement without an increase in calcium intake across the membrane calcium channels can also provoke electrical instability and seizure activity.[63]

In much the same way that magnesium lessens the ability of a heart cell to generate an ectopic beat, it also reduces the ability of the neuron to electrically destabilize and generate the electric "spark" that precipitates a seizure.[64] Magnesium blocks transmembrane calcium channels and lowers intracellular calcium levels, which can directly terminate seizure activity as well as prevent it from recurring. Some prescription calcium channel blockers, such as verapamil, can also help to electrically stabilize neurons, presumably by lowering intracellular calcium levels.[65] And even though more magnesium makes all conditions better and more manageable, it is essential for all seizure patients to vigorously supplement magnesium (while altogether avoiding all forms of calcium supplementation and excess dietary calcium).[66-67] Even

the most poorly absorbed forms of magnesium have been shown to help protect against seizure activity.[68]

## Magnesium and Poisonings

Patients who overdose on some drugs or who ingest frankly poisonous agents can end up with prolonged QT intervals, which leaves those patients at an elevated risk of sudden death from ventricular arrhythmias. Prompt and sufficient magnesium administration will quickly shorten this dangerous QT prolongation, allowing other measures, such as intravenous vitamin C, to have enough time to neutralize the poison or toxin involved while repairing the oxidative damage already inflicted by the toxin.

Multiple studies, mostly in animals, have demonstrated the ability of magnesium to neutralize or negate the impact of intoxications and poisonings, although the mechanisms have not been extensively studied.[69-72] The effect of magnesium on toxins relates directly to:

- ✓ Lowering cellular oxidative stress by calcium channel blocking
- ✓ Shortening of abnormally prolonged QT intervals
- ✓ Facilitating the uptake of vitamin C into toxin-exposed cells
- ✓ Support of the immune system and increased phagocytic capacity
- ✓ Binding of some toxins when still unabsorbed in the gut

When cells are infected, their "disease" is still only the increased intracellular oxidative stress due to the increased (often massively so) amounts of pro-oxidants (toxins) produced by the ongoing infection. While it remains relatively unstudied, the "anti-pathogen" effect of magnesium appears to be its ability to help normalize intracellular oxidation levels, making it impossible for the pathogen to any longer impair cellular function. Furthermore, magnesium has been shown to stimulate phagocytic activity, an

effect that can directly attack pathogens and not just mitigate the impact of toxins produced by them.

Vitamin C as a monotherapy was reported to consistently and rapidly cure acute polio (see Chapter 12). Dr. Neveu in France reported on the treatment of 15 cases of polio, ranging in age from 20 months to 47 years, using only oral magnesium chloride solution in the 1940s. The diagnoses of polio were clear-cut, and the clinical responses were always prompt and dramatic. Acute polio was cured in as little as 24 hours, and a more chronic form of polio contracted as long as four months earlier responded dramatically as well. Muscular paralysis also reacted very well, sometimes with complete resolution, even though complete flaccidity had already been present for an extended period. The "formula" was simple: Depending on age and body size, 15 to 125 ml orally every six hours of a 2.5% magnesium chloride solution [25 grams in 1,000 ml of water] was taken.

**...magnesium has been shown to stimulate phagocytic activity, an effect that can directly attack pathogens and not just mitigate the impact of toxins produced by them.**

Magnesium is a strong healing agent both with and without associated infection. These conditions include the following:

- ✓ Fractures[73]
- ✓ Diabetic foot ulcers[74]
- ✓ Burn wounds[75]
- ✓ Post-operative[76]
- ✓ Acute ischemic stroke[77]
- ✓ Activation of natural healing factors[78]

Despite the clear-cut ability of magnesium to support and accelerate healing in different clinical situations, relatively few studies have been conducted to establish this. Nevertheless, with the limited studies cited, it is clear that magnesium is one of several different factors that will reliably improve healing anywhere in the body.

## Optimizing Magnesium Levels

As people age and face increasing toxin exposures while ingesting increasingly magnesium-deficient food, the likelihood of finding anyone, especially an adult, with a completely normal intracellular and mitochondrial magnesium status becomes less likely. Toxins, or pro-oxidants, challenge every person on the planet and steadily increase the need for an increased electron supply from quality nutrition, along with the need for an optimal antioxidant presence to distribute those electrons throughout the body.

Not only has toxin exposure from air, food, and water steadily increased, but dietary magnesium intake has dropped dramatically as well. Modern food processing has depleted magnesium content by roughly 80% to 90%. In non-organically raised fruits and vegetables, before any processing has taken place, the magnesium content has already decreased by 20% to 30%. Furthermore, while toxin content in food has skyrocketed, the nutrient (antioxidant) content has reciprocally declined. It is also imperative that dedicated health seekers realize that the highest quality organic diet, perfectly digested, is wonderful, but that it will still never provide an optimal nutrient, antioxidant, or magnesium status with the unavoidable toxin exposures faced by everyone today. Because of this:

> **Magnesium supplementation (along with other selected supplements like vitamin C and vitamin D) is *absolutely essential* for anyone seeking optimal health.**

In other words, the toxin debt must be paid to achieve good health. The payment comes from reducing toxin exposures while optimizing nutrition and antioxidant intake. However, without vigorous magnesium supplementation supported by other quality nutrient supplements, the goal of a completely normal magnesium status in the body will never be realized.

**Unfortunately, the realistic goal for most individuals is to keep their intracellular magnesium deficits at minimally deficient levels.**

As only about 1% of magnesium is extracellular, blood levels of magnesium are largely irrelevant in reflecting the magnesium content in the body unless they are in the lower part of the laboratory reference range. However, when found to be low on the blood test, it simply indicates an ***advanced*** depletion of magnesium in the body. And because virtually everyone shows positive clinical responses with improved laboratory tests when they supplement with magnesium properly, it suggests that intracellular magnesium levels are almost always low in the older population and benefit from any added intake of magnesium.

Practically speaking, there is no point in monitoring blood magnesium except to document that supplementation has been successful at improving the magnesium level to a higher point on the reference range. In research studies that require the objective documentation of intracellular magnesium status, a sublingual epithelial cell magnesium assay can be performed. The results of this test have been shown to correlate well with the levels of magnesium found in muscle and atrial tissue biopsies.[79] If available, the sublingual epithelial cell magnesium assay is an excellent noninvasive way (versus muscle biopsy) to assess the normalcy of magnesium levels in the cells throughout the body. However, red blood cell (RBC) magnesium levels can also be of use in knowing that someone is at or approaching an optimal intracellular magnesium status. While the morphology of a RBC is unlike the other cells in the body, supplementing magne-

**Magnesium blocks transmembrane calcium channels and lowers intracellular calcium levels, which can directly terminate seizure activity as well as prevent it from recurring.**

sium to reach a "high normal" level inside the RBCs is a reasonable way to help assure that good magnesium levels have been achieved and that any remaining magnesium deficiency is no more than minimal. The reference range for RBC magnesium is 4.2 to 6.8 mg/dL. Supplementation should strive to reach and maintain a level of at least 6.0 mg/dL.

Studies have also demonstrated that magnesium levels inside monocytes, lymphocytes, and platelets can be measured. However, it is not clear that this will permit a better assessment of intracellular magnesium than as described above.[80-83]

Even if all the testing reveals that cells have normal magnesium levels, supplementation is still a good idea, as the highly toxic environment in which everyone now lives consumes and wastes magnesium rapidly daily. Nobody with normal renal function will ever naturally reach a state of magnesium excess, and very few individuals with normal renal function will easily maintain normal intracellular magnesium levels in the face of the unavoidable toxin exposures faced by everyone today.

There are many different oral forms of magnesium supplementation. While they can differ substantially in their absorption and bioavailability, all of them deliver magnesium and are beneficial. Some of the most common forms include the following:

- ✓ Magnesium chloride
- ✓ Magnesium glycinate
- ✓ Magnesium citrate
- ✓ Magnesium sulfate
- ✓ Magnesium taurate
- ✓ Magnesium gluconate
- ✓ Magnesium ascorbate
- ✓ Magnesium threonate
- ✓ Magnesium oxide
- ✓ Magnesium carbonate

Whatever form of oral magnesium supplementation one chooses, it is advisable to take a dose several times a day, gradually

increasing the amount until it begins to loosen the stools. Then backing off to a minimally lower dose that does not impact the stool quality would be a good long-term approach for settling on an optimal dosing regimen. And remember that the dosing requirement can drastically increase in the face of an acute infectious/toxic challenge, just like with vitamin C and some other nutrient agents.

An oral liposome-encapsulated form of magnesium threonate can be taken as well. With the unique properties of liposome encapsulation, this form of magnesium can be supplemented once daily and still achieve adequate to excellent delivery to the cells. Transdermal applications of magnesium, such as magnesium oil (concentrated magnesium chloride solution), can further improve magnesium levels in the body.

The most effective way to quickly and substantially improve, or even normalize, intracellular magnesium levels is by intravenous administration. When dealing with a patient who has significant and even life-threatening arrhythmias on Holter monitoring, it is advisable to give the patient repeated injections of magnesium as frequently as feasible, until there is a clear clinical stabilization with a documented decrease in ectopic beats on follow-up Holter monitoring, along with narrowing of the QT interval if it had been prolonged. In general, the importance of increasing magnesium intake for everyone is such that it is a wasted opportunity to receive an IV infusion for any reason without adding magnesium.

The clinical impact of intravenous magnesium on cellular levels is highlighted in several studies. Patients with acute or suspected myocardial infarction who received as much as 22 grams of magnesium sulfate intravenously over 48 hours were followed over 5 years. Even though this magnesium administration was not followed by the advice to continue oral daily magnesium supplementation, all-cause mortality was still significantly lower compared to the patients who did not receive the magnesium infusion at the end of the study period. There was also better pres-

ervation of the heart muscle and less heart failure in the treated group, which would also work to decrease all-cause mortality.[84-87]

Multigram doses of magnesium can be given rapidly intravenously very safely. Two grams of magnesium sulfate have been given IV push over fifteen seconds.[88-91] And as much as a gram of magnesium has been infused hourly over the following 24 to 48 hours. However, clinical circumstances could mandate even high dosing.

With the torsade de pointes form of ventricular tachycardia noted above, vigorous administration of magnesium sulfate is regarded as the first line of therapy for this arrhythmia.[92] Administering a few grams of magnesium via IV push in seconds would be the best initial approach. Once a positive response has been achieved, it is perfectly acceptable to proceed with a multigram magnesium infusion.

Low potassium levels are often present in conjunction with magnesium deficiency. Chronic diuretic therapy is often the main culprit for both these deficiencies. A substantial deficiency of either potassium or magnesium can have dire consequences. However, deficiencies of both can make effective arrhythmia treatment especially difficult. Both electrolytes are wasted in patients on chronic diuretic therapy. The diuretic-prescribing physician should consider managing patients without, or with very minimal, diuretic administration, especially if cardiac arrhythmias are also present. It is also worth noting that restoring magnesium levels to normal in potassium-depleted patients can be highly challenging to achieve.[93-95]

However, if there are no clinical indications of a magnesium deficiency that must be promptly addressed to increase magnesium levels rapidly, it is perfectly fine to start dosing with any of the oral forms. Magnesium oxide, a very cheap form of magnesium, is nevertheless capable of clearly improving intracellular magnesium levels.[96]

Additional routes of administration of magnesium for treatment or supplementation include transdermal, intramuscular, via enema, and nebulization. While not significantly supportive of improving magnesium levels in the body, nebulization with magnesium, especially in conjunction with sodium ascorbate and hydrogen peroxide, can be highly beneficial in addressing chronic pathogen colonization in the nose and throat. This combination effectively strips away biofilms and kills the underlying pathogens, often allowing normal gut function to return in those individuals. Intramuscular and enema administrations would deliver more magnesium to the body than nebulization, but should not be relied upon by themselves to reach or maintain normal intracellular magnesium levels.

> **Arguably, the best way to know that intracellular mitochondrial magnesium levels are normal or very near to normal is by administering a Holter monitor test. This test records and prints out every beat of the heart on an ECG strip over a 24-hour (or longer) period. When this test is *completely normal and entirely free of extra beats*, it can be comfortably concluded that the heart cells (and the cells throughout the rest of the body) have sufficiently normal levels of magnesium. Conversely, the degree of magnesium deficiency inside the cells of the body will correlate well with the overall frequency and complexity of the extra beats recorded on the Holter study.**

## Recap

Magnesium deficiency in the body is widespread worldwide, mainly due to steadily increasing toxin exposures combined with a food supply that has steadily declined in its magnesium content over the decades. Low cellular magnesium is a primary cause of several diseases and a contributing factor in ***all*** diseases, regardless of their underlying cause.

Excess intracellular calcium is present in all diseases, and magnesium is the primary and natural way to regulate and lower these levels. Because of this impact on all diseases, and because nothing can compensate for a magnesium deficiency other than supplemental magnesium, It is the most critical supplement in promoting and supporting good health. Of course, many other supplements are very beneficial, but magnesium remains at the top of the list. Potassium deficiencies often accompany magnesium deficiency, and supplementing potassium is vital in having the body better retain any supplemented magnesium while supporting its function.

While magnesium is beneficial for all conditions, it is especially essential for the stabilization of electrically active cells in the body. In the heart, low magnesium is the pathology that both permits and facilitates the presence of abnormal heartbeats and arrhythmias. Similarly, it is essentially the same intracellular pathology that electrically destabilizes neurons to the point of precipitating (and sustaining) seizures and seizure-like activity. Maintaining completely normal intracellular magnesium levels, especially in the mitochondria, would either prevent or eliminate ***virtually all*** heart arrhythmias and seizure disorders. Because of this, restoring an abnormal Holter monitor test to normal is a very practical way to know magnesium levels are normal in the absence of precise measurement techniques.

There are many different forms of magnesium and routes by which they can be administered. Intravenous administration is especially effective in rapidly elevating intracellular magnesium, and there should be no hesitation in using this route to help stabilize the patient quickly, particularly for patients with arrhythmias and seizures.

## Chapter 14

*I was educated once—it took me years to get over it.*

Mark Twain

# Niacin, Vitamin C, and the Central Nervous System

## Toxicity Concerns Frequently Result in Severe Underdosing of Essential Nutrients

Orthomolecular medicine is based on the concept that most chronic diseases are ultimately initiated and sustained by the chronic deficiency of one or more vitamins, minerals, nutrients, or other natural agents. When the deficiency can be lessened, the disease improves. Conversely, the worse the deficiency and the longer it persists in the body,ß the more advanced and entrenched the disease becomes. What is often unclear to both the public and many healthcare practitioners is that the clinical benefits of some nutrient supplements ***continue to increase as the doses are increased***. These doses can ***vastly*** exceed the Recommended

Dietary [or Daily] Allowance (RDA) guidelines disseminated by the Food and Nutrition Board, a committee established by the United States National Academy of Sciences. Since 1997, the term Dietary Reference Intake (DRI) has been in use to describe much the same information as the RDA. The DRI recommendations have not significantly deviated from the earlier RDA recommendations.[1]

While a few nutrients can become toxic even with intake that only minimally exceeds nutritional requirements (such as calcium, copper, and iron), many nutrients exhibit little toxicity at almost any dose.[2] Generally, it is difficult to push most vitamin doses to the point of clinical toxicity. However, many of the nutrient minerals can be taken to excess and result in various presentations of toxicity. Toxicity in this context refers to ***definable physiological damage*** to the supplement taker, not occasional side effects such as nausea in a sensitive stomach (niacin) or osmotic diarrhea (vitamin C or magnesium) when too much is not efficiently absorbed but accumulates in the colon instead.

> **However, the concern about potential toxicity keeps supplements like niacin, vitamin C, and magnesium severely *underdosed*, resulting in a loss of many of the incredible benefits they offer when optimally dosed.**

## Vitamins: Safe and Beneficial

Vitamin C is the safest of all known nutrient supplements. A dose of vitamin C above which toxicity will reliably ensue has never been established. This is consistent with the fact that vitamin C is the molecule on which the physiology of all cells runs, and the healthy function of the body relies on having large amounts of it both inside and outside the cells. Arguably, vitamin C is the ***safest consumable agent*** in existence. Rare individuals can experience minimal side effects, but this should not be confused with

any degree of cell-damaging toxicity. By contrast, excessive water intake is toxic and can even be fatal.[3-5]

The vitamin C RDA for older children and adults ranges from 45 to 90 mg per day. However, many people maintain a much higher level of general health when multigram supplementation is taken regularly, on the order of 100 times the RDA. Furthermore, the administration of vitamin C in doses ***1,000 times*** the RDA is frequently given intravenously around the world for the treatment of a wide range of infections and medical conditions, with excellent effect and unrivaled safety.[6-8]

These high doses of vitamin C are not only immensely therapeutic for infections and toxin exposures, but they also indicate that doses much higher than the RDA are entirely appropriate and ***normal*** for maintaining good health. In a study examining the impact of vitamin C on bone health, it was clearly shown that optimal dietary sources of vitamin C ***did no***t affect the risk of osteoporotic fracture. In contrast, supplemental vitamin C was found to result in fewer hip fractures.[9] Similarly, another study found that just dietary sources of vitamin C had no significant impact on bone mineral density. In contrast, supplemental vitamin C was able to increase bone mineral density substantially.[10] This is because it is difficult to take in more than a few hundred milligrams of vitamin C daily in just about any diet, while supplemental vitamin C doses much higher than can be achieved by diet (multigram and more) can be taken and are beneficial. This further indicates that most humans are geneti-

**...the concern about potential toxicity keeps supplements like niacin, vitamin C, and magnesium severely *underdosed*, resulting in a loss of many of the incredible benefits they offer when optimally dosed.**

cally deficient in vitamin C production, resulting in general health impairment (see Chapter 11).

Magnesium, like all minerals, can be pushed to toxic levels. However, it is almost impossible to induce toxicity with ***oral*** magnesium intake, as the highest levels of intake will reliably induce an osmotic diarrhea from unabsorbed magnesium reaching the colon long before bodywide toxicity occurs. However, when administered intravenously, sufficient magnesium reliably lowers even the most elevated blood pressures to hypotensive levels. In some surgeries, magnesium is infused to deliberately lower blood pressure below normal levels, helping to achieve hemostasis and prevent excessive bleeding in the surgical field.[11-13]

Very highly dosed infusions of magnesium should only be administered in a hospitalized setting. However, the addition of a few grams of magnesium can be safely infused over an hour or so in a clinic setting by adding a few grams to a therapeutic vitamin/mineral IV bag. The appropriate administration of magnesium by IV infusion is the most effective way to help restore low cellular levels of magnesium, especially in patients who cannot take it orally in large amounts.[14-15] Some caution and dosage adjustments are necessary for the clinician when there is decreased kidney function.

**Of the 13 essential vitamins (A, C, D, E, K, B1, B2, B3, B5, B6, B7, B9, B12), increased intake and/or increased blood levels have been associated with decreased all-cause mortality for 11 of them.**

Just like vitamin C, but much less dramatically so, oral magnesium supplementation of several grams daily can be taken as long as the osmotic diarrhea is not induced. With a magnesium RDA of roughly 300 to 400 mg daily, the amounts of supplementation to keep most adults out of a significant deficiency

of magnesium will be in the range of 5-fold or more of this RDA. Furthermore, very few people can reach an optimal magnesium status with oral supplementation. Rather, ***the practical goal is to minimize the degree of magnesium deficiency***. Nevertheless, as a significant magnesium deficiency can cause certain diseases and exacerbate others, taking as much magnesium supplementation as can be readily tolerated is always a good idea.[16]

Of the 13 essential vitamins (A, C, D, E, K, B1, B2, B3, B5, B6, B7, B9, B12), increased intake and/or increased blood levels have been associated with decreased all-cause mortality for 11 of them.[17-25] Studies establishing the same associations with biotin (vitamin B7) and pantothenic acid (vitamin B5) were not found. For the most part, these studies have only examined vitamin intakes within the range of the RDA or DRI values, further supporting their critical role in promoting good health, even when ingested in relatively small amounts. While toxic effects can be observed with excessive dosing of vitamin A, vitamin D, or vitamin E, the rest have RDA or DRI values that can be greatly exceeded without adverse health effects, resulting instead in improved health and blood chemistries.

## Niacin: Nomenclature and Physiology

Confusion can easily arise in sorting through the literature on niacin and its derivatives. niacin is vitamin B3. It is also known as nicotinic acid. These are all synonyms for the ***chemically identical*** substance. niacin, vitamin B3, and nicotinic acid are completely interchangeable terms. For completeness, niacin is sometimes, although rarely, referred to in the literature as "vitamin PP," with the PP meaning "pellagra-preventive." Pellagra is the clinical condition that results from a severe deficiency of niacin in the body.[26]

Niacin has several vitamers. ***Vitamers are derivatives or related chemical substances that fulfill the same specific vitamin functions despite not being chemically identical***. Niacin derivatives that

qualify as vitamers include niacinamide (also known as nicotinamide or nicotinic acid amide), nicotinamide riboside, and nicotinamide mononucleotide. Referring to nicotinamide as niacinamide decreases the likelihood of niacin and its vitamers being perceived by the public as having nicotine-like properties, which they do not. All these substances promote the biosynthesis of NAD (nicotinamide adenine dinucleotide) throughout the body, and they are the ***primary precursors*** of NAD.[27-28]

**Large amounts of NAD are essential for optimizing electron flow in the first of the four steps of the electron transport chain (ETC).**

Large amounts of NAD are essential for optimizing electron flow in the first of the four steps of the electron transport chain (ETC). Located along the membranes of the mitochondria inside every cell, the ETC is responsible for the production of nearly all the ATP (adenosine triphosphate) in the body. ATP is the most critical energy-providing molecule in the body. Any compromise in its production results in a decline in the healthy function of all tissues and organs affected. Decreased ATP levels also result in reduced vitamin C levels. When deficient amounts of NAD are present at the beginning of the ETC, sufficient ATP cannot be generated.

**Optimizing the production of NAD for ATP synthesis in the cells is the most critical function of niacin and its vitamers.**

Furthermore, greater deficiencies in available NAD result in even more pronounced declines in cellular function throughout the body. Along with cellular vitamin C, nothing is more critical for optimal health than maximal amounts of intracellular ATP.[29] Low NAD levels have been recognized as a sign of aging in not

only humans, but in all living cells, including those in animals and insects.[30-36]

## Niacin Supplementation

Names of forms of niacin supplementation that directly fuel NAD production in the body:

- ✓ Niacin
- ✓ Niacinamide
- ✓ Nicotinamide
- ✓ Nicotinamide riboside
- ✓ Nicotinamide mononucleotide
- ✓ Inositol hexaniacinate
- ✓ Inositol hexanicotinate

Notably, niacin has an additional important property that its vitamers do not possess. Reported as early as 1955, niacin has been documented to lessen the abnormal lipid parameters that promote atherosclerosis.[37-39] It reduces triglycerides and the lipoproteins VLDL and LDL while raising HDL, the "good" lipoprotein.[40]

If well-tolerated, niacin is the better supplement form of those listed above, as it has both a positive impact on lipids and NAD levels in the body. It also costs less. However, niacin causes a warm to hot flushing effect in many people who supplement it. While for many people this flushing effect is either minimal or disappears after several doses, for others it is intolerable. The other supplement forms noted above are "flush-free" and can be easily taken by nearly everyone. The downside is that the non-flushing forms do not have the positive lipid impact of unmodified niacin.

Niacin and all its vitamers profoundly impact ATP generation throughout the body, as noted above. However, like many other powerful orthomolecular therapies, the niacin RDA and DRI recommendations are ***amazingly tiny***, completely misleading the health seeker as to their importance and the impact of much higher doses. The optimal energy-supporting doses of niacin can

be 200- to 1,000-fold (20,000% to 100,000%) higher than these "officially recommended" doses. Aside from nausea in a few individuals, side effects are decidedly uncommon.[41] Very high doses have been linked to liver toxicity, as reflected in significant liver enzyme elevation. However, minor enzyme elevation, which typically resolves without discontinuation of the supplementation, is not uncommon. Such enzyme increases are believed to represent a temporary increase in metabolic activity in liver cells, rather than inflammatory damage.[42]

In the toxin-laden, pro-oxidant environment in which we now all live, virtually everyone is deficient in the antioxidant impact provided by niacin supplementation and the NAD levels it supports. Everyone should consider taking at least some niacin or niacinamide supplementation. A dietary regimen that provides the NAD-producing benefits of even minimal niacin supplementation does not exist.

## Niacin, Health, and Schizophrenia

Optimizing the production of ATP in the body is a very desirable goal. Many clinicians today regard chronic fatigue patients as having "mitochondrial dysfunction" or "mitochondrial fatigue." While decreased ATP production is uniformly present in such patients, the reasons for this decline in production can vary among different patients.[43] However, except for individuals with genetic deficiencies that typically cannot be completely resolved, increasing the production of ATP not only can resolve the fatigue and associated symptoms, but it can also infuse the needed energy into the dysfunctional metabolic pathways to completely resolve the biochemical abnormalities that decreased the ATP production in the first place. Quite literally, this results in ***cellular healing***. Niacin supplementation has been shown to restore healthy NAD levels (which then increase ATP production), significantly improving muscular strength in patients with mitochondrial dysfunction.[44]

Ultimately, all such dysfunction within the cytoplasm, as well as within the mitochondria, stems from an increased number of inactivated, oxidized biomolecules (increased intracellular biomolecule oxidation—increased IBO) relative to the number of normal, reduced biomolecules. This is traditionally referred to simply as increased intracellular oxidative stress. Improvements in all pathological states can be anticipated with increased ATP production. However, certain conditions, such as muscle fatigue from low ATP levels, can be expected to respond even more dramatically. The heart muscle in heart failure is a classic example of a tissue severely depleted of ATP, unable to respond to significant exercise with a sufficiently increased production of ATP.[45]

**The heart muscle in heart failure is a classic example of a tissue severely depleted of ATP, unable to respond to significant exercise with a sufficiently increased production of ATP.**

Endomyocardial biopsies have shown that the heart muscle in congestive and hypertrophic cardiomyopathies has significantly depressed levels of both ATP and NAD.[46] Normal heart muscle has the highest NAD levels in the body.[47] In both congestive and hypertrophic cardiomyopathy, impaired energy metabolism has been identified.[48] Consistent with these findings, the elevation of NAD levels in different studies has been shown to improve atherosclerosis as well as other forms of heart failure, including ischemic, hypertrophic, and congestive cardiomyopathies.[49-50] In an animal study, niacin has also been shown to lessen damage in myocardial infarction.[51] Studies in both animals and humans have shown that niacinamide can lower elevated blood pressures and decrease cardiac mortality.[52-53] In a mouse model of cardiac arrest, niacinamide administration was able to normalize NAD levels and improve survival.[54]

Niacin vitamer supplementation in humans has been clearly shown to increase blood levels of NAD dramatically.[55] Not surprisingly, NAD-increasing agents, with their strong support of ATP production, are also increasingly appreciated for their utility in both anti-aging and overall good health.[56-61] In an animal study of sepsis, arguably the most advanced and dire of medical conditions, a niacin vitamer was shown to increase survival and prevent the lung and heart injury otherwise seen.[62]

**...like niacinamide, CoQ10 improves heart failure patients with preserved ejection fractions (hypertrophic cardiomyopathy with diastolic dysfunction).**

Some studies suggest that lower NAD and ATP levels are primary abnormalities that contribute to the development of cancer.[63-65] In one human study, it was demonstrated that niacinamide supplementation was effective in reducing the incidence of new skin cancers.[66] This is consistent with the pellagra-associated skin inflammation (dermatitis) seen when niacin levels are very low.[67] Higher niacin intake has been linked to a decreased risk of all-cause mortality, indicating its importance in every cell of the body.[68-69]

The clinical effectiveness of daily multigram niacinamide dosing depends on how severely the affected tissues or organs in a disease are depleted of the NAD needed to make ATP. Heart failure, although not always responsive to increased NAD production, often responds dramatically to an improved NAD status. A significant number of patients with congestive cardiomyopathy and low cardiac output have been spared heart transplantation after adequately dosed Coenzyme Q10 (CoQ10), another agent capable of increasing ATP production via the ETC in the mitochondria. In many of these patients, ejection fractions have increased ***dramatically***, and all-cause mortality decreased, along with improved exercise capacity.[70-76] Also, like niacinamide, CoQ10 improves heart failure

patients with preserved ejection fractions (hypertrophic cardiomyopathy with diastolic dysfunction).[77-78]

Niacinamide also upregulates ETC activity, resulting in the production of more ATP. In addition to its ability to be directly converted into NAD, niacinamide also supports the formation of more CoQ10. More specifically,

> **Niacinamide has been shown to enhance acetyl-CoA production, which in turn *improves the biosynthesis of CoQ10*.**

This means that niacinamide supplementation can provide the substrates needed for both NAD and CoQ10 production, directly helping to power two of the four steps of the ATP-producing ETC. And CoQ10 also supports the first two steps of the ETC.[79-80]

Like the heart muscle, the brain and central nervous system (CNS) require very high levels of ATP for normal function relative to the rest of the body. As such, having inadequate building blocks for ATP production in the body will be reflected ***more often and more prominently in the nervous system and psychiatric disorders than in other medical conditions***, in addition to its importance in heart disease. Many studies have indicated that niacinamide is essential for the development, growth, and maintenance of the CNS.[81-83] Furthermore, niacinamide has been shown to readily pass the blood-brain barrier in both directions, supporting its supplementation as a simple and effective approach to treating various CNS conditions.[84] Additionally, oral niacinamide supplementation has been demonstrated to be very well-absorbed.[85]

Animal studies have shown that niacinamide will protect against ischemia-induced (decreased blood supply) damage in the brain and CNS. Neuronal death is reduced, and the recovery of affected sensory and motor function is improved as well.[86-89]

Significant infection protection and resolution can be seen when NAD production is optimized with niacin and several other NAD-producing agents. Increased levels of niacin support recovery from sepsis. COVID has also been shown to resolve more rapidly with agents that help to optimize cellular ATP levels.[90-93] Improved outcomes in COVID-related acute kidney injury have been seen with niacinamide therapy.[94] Niacinamide has also been shown to lessen inflammation-induced renal failure in an animal model.[95] It has a protective effect against the pro-inflammatory toxicity of paraquat in rats.[96]

**Alzheimer's, Parkinson's, amyotrophic lateral sclerosis (ALS), and schizophrenia have all been documented to have pathogens, their toxic metabolites, or both present in the affected nervous tissue.**

Severe niacin deficiency results in a disease known as pellagra. This syndrome has been characterized by a triad of symptoms: delirium, dermatitis, and diarrhea. More accurately, the triad should be referred to more broadly as neurocognitive, dermatological, and gastrointestinal symptoms. A substantial variation in this symptom pattern can be observed, as the circumstances resulting in a deficiency of niacin can lead to a variety of other significant nutrient and micronutrient deficiencies in a given patient.[97-99] Nevertheless, the complete restoration of niacin levels in the body, along with the micronutrients supplied by a balanced diet, reliably resolves the symptoms of pellagra, including those involving the CNS.

The neurocognitive symptoms in patients with severe niacin deficiency are always present, and they can be very pronounced clinically. Both Alzheimer's disease and Parkinson's disease typically have depleted NAD levels in the affected tissue, and some of their

symptoms can be lessened with increased niacin intake.[100] Other CNS symptoms, including disorientation, memory loss, confusion, dementia, poor sleep, and even frank psychosis, can be seen in the severely niacin-deficient patient.[101] Of note, the statistical risk of developing Parkinson's disease is lessened in individuals having an increased consumption of niacin-containing foods.[102-103]

Schizophrenia is one of the most devastating diseases, with enormous negative societal impact in addition to the incapacitating symptoms endured by the patient. Advanced schizophrenia effectively results in the complete loss of a functional life.[104] Chronically increased oxidative stress defines a state of chronic inflammation in the brain (neuroinflammation). The presence of chronic inflammation in the brains of schizophrenic patients has been well-documented.[105-106] Studies have shown that schizophrenia in younger individuals can be initiated following exposure to the toxins, or pro-oxidants, encountered in prenatal exposures to infection.[107-108] Consistent with this, many cases of schizophrenia start early in life with toxin-induced abnormal neurodevelopment.[109-110]

**Both Alzheimer's disease and Parkinson's disease typically have depleted NAD levels in the affected tissue, and some of their symptoms can be lessened with increased niacin intake.**

The symptoms of schizophrenia are numerous and diverse, with some symptoms assuming a much more prominent role in one patient versus another. The bulk of the literature recounts the classical and well-known symptoms of schizophrenia that focus solely on brain dysfunction. Such symptoms include hallucinations, delusions with loss of contact with reality, difficulty thinking clearly, and social/emotional withdrawal, sometimes to the point of staying in an essentially motionless, catatonic state. However, it has also been recognized that symptoms not directly referable to brain

dysfunction are often present as well. These include the classical symptoms of pellagra, a potentially fatal condition secondary to severe niacin deficiency in the body.

The niacin deficiency in pellagra can result in brain and CNS pathology manifesting as irritability, difficulty concentrating, some social withdrawal, depression, manic depression, insomnia, delirium, hallucinations, coma, and even frank psychosis. Some authors have referred to this as "pellagroid encephalopathy."[111] Furthermore, the psychosis with associated delusions that sometimes occurs in pellagra can be indistinguishable from some cases of schizophrenia.[112] These symptoms all typically resolve with adequate restoration and maintenance of niacin levels in the brain and the body.[113] The effective use of niacin for psychiatric symptoms has also spawned the concept of "reversible dementia," a remarkable term since dementia is generally considered to be progressive and non-resolving in nature, especially in older individuals.[114] Similarly, the close relationship between pellagra and brain dysfunction has spawned the term "niacin-responsive subset of schizophrenia."[115]

**The niacin deficiency in pellagra always has symptoms of brain dysfunction, and niacin restoration treats them very effectively.**

Pellagra causes significant gastrointestinal problems and symptoms. This is significant in understanding the contribution and worsening that a pellagra-related leaky gut with a pathogen-overgrown microbiome does to diseases of the CNS (and elsewhere in the body).

**Alzheimer's, Parkinson's, amyotrophic lateral sclerosis (ALS), and schizophrenia have all been documented to have pathogens, their toxic metabolites, or both present in the affected nervous tissue.**[116-127]

The damage that niacin deficiency (pellagra) does to the microbiome is a major factor in the associated neuropsychiatric problems and schizophrenia-like symptoms seen with it as well. Niacin deficiency not only results in decreased energy production in the brains of people with schizophrenia, but it also results in the continued exposure to pathogens and/or their toxic metabolites from an abnormal gut microbiome to the CNS of those patients.

Schizophrenia most commonly appears in late adolescence or early adulthood.[128] However, it can also occur later in life. If left unchecked, increased intracellular oxidative stress results in the premature death of the affected cells. Brain volume studies have established that schizophrenic patients progressively lose gray matter and the actual physical mass of the brain over time, well beyond the deterioration seen with aging.[129-132] Microglia, the scavenger white blood cells of the brain, become activated in the inflammation associated with schizophrenia.[133-135] Pro-inflammatory cytokines and other inflammatory markers are also increased.[136-138] All this information leads to the following assertion:

**Schizophrenia is a chronic encephalitis.**

Encephalitis is inflammation of the brain, typically occurring acutely in conjunction with a new viral infection, precipitating widespread inflammation throughout the brain and CNS. In schizophrenia, the chronically elevated inflammatory parameters indicate that ongoing inflammation is causing the signs and symptoms of schizophrenia. Schizophrenia = chronic brain inflammation = chronic encephalitis.[139] Many of the symptoms seen in acute encephalitis of the brain are also seen in the chronic encephalitis of the brain of the schizophrenic patient, including alterations in consciousness, confusion, hallucinations, and cognitive impairment. Some authors have descriptively referred to schizophrenia as "the shattered

mind."[140] The steady destruction of brain tissue by the chronic inflammation also explains why schizophrenia of several years duration responds less readily to any nutrient or drug regimen than schizophrenia of recent onset. The chronic inflammation slowly destroying brain tissue in schizophrenia is analogous to the patient with ongoing myocarditis and death of heart muscle, eventually going into congestive heart failure. The later a positive therapy is started, the less effective it will be.

**In a group of 30 acute schizophrenia patients, one gram three times daily of niacin or niacinamide was given for *only 30 days*, and the patients were then followed for one year. 80% of the niacin-treated group recovered, compared to 33% of the placebo-treated group.**

The effective clinical resolution of many people with schizophrenia is further complicated and even impaired by the common and severe side effects seen with the drugs commonly used in their treatment. ***Many of these side effects are indistinguishable from the symptoms for which the drugs are being administered***. Such symptoms include restlessness, brain fog, and social withdrawal, accompanied by a loss of interest in interacting with others.[141] Once a schizophrenic patient has received prescription drugs for a long enough period, it can become impossible to know when the condition itself is getting worse or when a drug needs to be discontinued and/or decreased in dosage. As it is, the clinical picture of an unmedicated schizophrenic patient also spans a variety of symptoms present in many different combinations.[142]

The levels of niacin in schizophrenic patients are consistently low, oftentimes severely so. This also means that their

cellular ATP levels are significantly depressed as well. It has been clearly shown that highly dosed (relative to RDA or DRI recommendations) niacin (or a niacin vitamer) often ***completely resolves*** schizophrenia, even in its advanced stages. And when clinical resolution is not complete, ***significant improvement*** in the major symptoms of schizophrenia is nearly always seen.

In a group of 30 acute schizophrenia patients, one gram three times daily of niacin or niacinamide was given for ***only 30 days***, and the patients were then followed for one year. 80% of the niacin-treated group recovered, compared to 33% of the placebo-treated group.[143] Recovery in acute or chronic schizophrenia was only considered to have been reached when the patient

- ✓ Had complete disappearance of disease-related symptoms and signs,
- ✓ was interacting normally with family members as well as members of the community,
- ✓ and became gainfully employed.

Vitamin C, a perfect treatment for any condition involving chronic inflammation (which is the case for all conditions), was also often administered in doses of 1 to 10 grams daily. As the primary antioxidant (anti-inflammatory agent) in the body, vitamin C should always be used to help resolve the brain inflammation of schizophrenia, or inflammation anywhere else, since the primary characteristic of inflamed tissue is severe vitamin C depletion in that tissue.[144] Much higher doses will always help, and sometimes dramatically so, especially in schizophrenia of recent onset.

While not typical, acute schizophrenia can spontaneously resolve. Presumably, the factors provoking inflammation in the brains of these patients eventually resolve or become signifi-

cantly less pronounced (e.g., infection, toxin, autoimmune reaction, micronutrient deficiency).

Six more double-blind, randomized, and controlled clinical trials confirmed the positive impact of niacin on the recovery of schizophrenic patients.[145-146] Many of the most chronic patients (with the most structural brain damage) required this therapy for ***five or more years*** to derive clear benefits.[147] For the niacin treatment of schizophrenia, the starting dose was 1,000 mg three times daily, with the dose slowly increased to as much as 4,500 to 18,000 mg daily, depending on clinical response. For those treated with niacinamide rather than niacin, the daily dose rarely exceeded 6,000 mg due to the increased problems with nausea and stomach sensitivity.[148-150]

**Niacin cures acute schizophrenia most of the time. And substantial clinical improvement is the rule, even when a complete cure is not realized in either acute or long-standing schizophrenia.**

Dr. Abram Hoffer treated over 5,000 schizophrenic patients with this niacin protocol. No deaths ever resulted from the administration of niacin. Furthermore, consistent with the wide-ranging positive effects of niacin on NAD levels throughout the body described above, Hoffer noted improvements in many symptoms not directly attributable to schizophrenia in his niacin-treated patients.[151] He also developed a more comprehensive orthomolecular approach to treating schizophrenia over the years of his clinical practice.[152] Currently, over 85% of chronic schizophrenic patients treated with traditional measures never resolve, even if some treatment benefits are realized. Instead, they remain sick and dysfunc-

tional for the rest of their lives when niacin is not at least a part of their treatment program.

The following can be definitively asserted:

> **Niacin cures acute schizophrenia most of the time. And substantial clinical improvement is the rule, even when a complete cure is not realized in either acute or long-standing schizophrenia. Nevertheless, the adoption of a proper niacin-based treatment protocol for acute schizophrenia would *eliminate the existence* of advanced chronic schizophrenia and its associated irreversible brain damage.**

As covered above, schizophrenia, with its close connection to pellagra, is a condition precipitated and worsened by multiple factors. A quality diet and a wide array of vitamins and mineral nutrients are mandatory for an optimal clinical response in all these patients. Several reasons account for the varied (but positive) clinical responses of schizophrenia patients treated with niacin.[153] ***Nevertheless, monotherapy with niacinamide has completely resolved schizophrenia***.[154] As an essential and non-toxic nutrient, niacin (or niacinamide) ***should never be denied*** to any patient with any brain disorder, much less schizophrenia. As Dr. Hoffer put it: "Apparently, the worst sin in orthodox medicine is to see a recovery for the wrong reason."

The production of ATP, the final physiological goal of the ETC in the cells of the body, is specifically nurtured and supported not only by niacin but also by riboflavin, CoQ10, and methylene blue. These four agents directly power the different steps in the mitochondrial ETC needed to optimize ATP production, which directly supports and promotes all healing and good health. And when permanent brain damage

is minimal and the symptoms are due to ongoing neuroinflammation, an excellent clinical response can be anticipated, even if a complete cure is not realized. Niacin, CoQ10, and riboflavin comprise a nutrient triad that has been shown to benefit the antioxidant status of breast cancer patients.[155-157] And even though vitamin B3 is essential for optimal health, its optimal dosing is achieved by few individuals.

While it is suitable for everyone, and not just for the brain, it nevertheless needs to be asserted that:

> **Anybody with ANY psychological, behavioral, and/or psychiatric condition should take niacin or one of its vitamers, and the dose should be maximized before considering such a condition permanent or unresponsive.**

Currently, the standard of care in psychiatry does not include the routine administration of niacin or niacinamide for schizophrenia or any other mental or emotional disorder.

> **While the established standard of practice is usually sufficient to protect a physician from malpractice, deliberately avoiding the usage of niacin for schizophrenia after being exposed to much of the literature and information cited in this chapter nevertheless constitutes clear medical malpractice, even if it remains unadjudicated.**

Healthcare practitioners have an obligation, albeit rarely honored, to stay informed on the science of old, current, and new therapies. The benefit of niacin therapy in schizophrenia and most brain disorders is certainly not a new discovery. As with all other conditions that have been shown to benefit from an orthomolecular approach to addressing vitamin, mineral, and other nutrient deficiencies, a healthcare practitioner

should always be open to all legitimate scientific information that the patient might offer. If a practitioner refuses to review or discuss such information with the patient, it is time to find a new one.

> **You do not need a doctor's prescription to take niacin, and there are no absolute contraindications to its use. You can take it for yourself, and you can advise any friend or family member with a neurological or psychiatric condition that you have information indicating that it is often beneficial, regardless of the precise diagnosis.**

## Recap

Niacin and its related compounds have a long history of improving the mental status of a wide variety of mental and emotional disorders. It has been shown to cure or significantly improve most cases of schizophrenia for which it is properly dosed. A severe deficiency of NAD primarily causes these disorders by not properly fueling the ETC in the ATP-generating mitochondria in all cells. The primary role of niacin is to increase NAD levels, resulting in an improved or even normalized amount of cellular ATP, the most crucial energy-providing molecule in the body. While many other nutrients will be of benefit in schizophrenia, highly dosed vitamin C and magnesium should always be given to further control and quell the ongoing neuroinflammation.

Pellagra, the disease established to occur after severe and long-standing niacin deficiency, typically presents with significant brain dysfunction, sometimes clinically identical to schizophrenia. niacin administration often completely resolves such states of psychosis, further supporting the concept that

NAD depletion, leading to depressed ATP levels in the brain, is the root cause of schizophrenia.

A chronic NAD deficiency always causes increased oxidative stress in the affected tissue. This means that schizophrenia is chronic encephalitis, as chronic encephalitis means an ongoing state of neuroinflammation in the brain.

The variability in the clinical response of schizophrenia to niacin therapy is primarily due to the presence of other nutrient deficiencies and whether they are correctly restored. How long the schizophrenia has been present and how much irreversible brain damage (decreased brain mass) has occurred are also critical factors in determining how much clinical benefit can be realized.

Even though the psychiatric standard of care does not include niacin therapy for schizophrenia, it can only be considered malpractice not to apply it, especially considering the enormous physical, mental, and societal impact of this dreaded disease. Opting not to use a toxic therapy that might only help a little for a relatively minor condition can be a wise decision; however, this is certainly not the case for employing niacin in the treatment of schizophrenia. That reasoning is reserved for many pharmaceutical agents, not natural nutrients.

## Chapter 15

*Most men die at 27, we just bury them at 72.*
Mark Twain

# Methylene Blue: Antioxidant Extraordinaire

## Amazing Exception to the Rule

Linus Pauling first coined the word "orthomolecular" in an article he wrote in the journal *Science* in 1968. Quite simply, ortho means right (correct), and molecular refers to the simplest building block of any substance. Dr. Pauling asserted that the only proper way to prevent or treat any medical condition is to restore to normal whatever important natural substances (nutrients, vitamins, minerals) that are depleted in a patient. A corollary of this approach to healthcare is that no patient is sick because they have "low levels" of any synthesized (i.e., not naturally occurring) agents (prescription drugs).

As a rule, a pharmaceutical agent impacts some metabolic pathway in such a manner that it helps alleviate a symptom ***without lessening*** the pathology that causes the symptom to be present. With the rarest of exceptions, pharmaceutical agents

reliably allow a disease to continue evolving while one or more of its associated symptoms are chronically suppressed. However, when deficiencies of important natural substances are corrected, positive clinical results not known to (or acknowledged by) traditional medicine are consistently seen. Clinical improvement following the resolution of such deficiencies typically indicates that the underlying disease is no longer progressing and sometimes even reversing. And depending on the severity of the condition, an eventual return to physiological normalcy can also occur.

**Just like vitamin C, the actual benefits of MB in treating various diseases remain underappreciated and underutilized by most clinicians, despite its safe use in many patients for a significantly more extended period than vitamin C.**

Probably the most noteworthy of chronically depleted nutrients in a large majority of people worldwide is vitamin C, although significant magnesium deficiencies are also widespread. The literature supporting the positive health impact of vitamin C, when properly administered, is extensive and spans over 80 years.[1] The benefits of vitamin C and many other critical orthomolecular substances continue to be suppressed and even belittled in biased and frequently fraudulent medical articles. The patented drugs that are promoted relentlessly make it difficult for even the most motivated of healthcare practitioners to recognize the benefits of an inexpensive natural remedy, which is often the best option for their patients.

Such "education" on the "essential" role of pharmaceutical drugs begins in medical and osteopathic schools, and it never stops. Furthermore, without the endorsement of traditional medicine, many healthcare practitioners are reluctant to use natural agents

even when they are fully aware of the benefits. Also, as evidenced during the COVID pandemic, it appears that most pharmaceutical companies, along with too many hospitals and far too many physicians, place profits ***far*** ahead of patient welfare. The application of scientifically based treatment protocols, many of which are grounded in orthomolecular principles, continues to be overlooked and ***even suppressed***.

Methylene blue (MB), a powerful antioxidant with a clinical impact ***comparable to*** that of vitamin C, is a notable exception to the principles of orthomolecular medicine. It is not produced in the body, and it is not naturally present in any animal or plant. Nevertheless, its documented beneficial health effects rival those of any other known substance, whether naturally occurring or synthesized in a laboratory. Just like vitamin C, the actual benefits of MB in treating various diseases remain underappreciated and underutilized by most clinicians, despite its safe use in many patients for a significantly more extended period than vitamin C. Although nobody suffers from a "deficiency" of MB, as is the case with vitamin C, many people are worse off for not being aware of its benefits and using it for various conditions.

## VC and MB: Great Antioxidant Partners

The parallels between vitamin C and MB are also reflected in the fact that administering them in ***either*** their reduced or oxidized form is comparably beneficial to the patient. This is because the overall ***quantity*** of vitamin C and/or MB is the factor that determines how well newly assimilated electrons from the diet are optimally distributed throughout the body (See Chapters 1 and 9).

> **A quality nutrition program is the primary source of new (versus recycled) electrons in the body. The qualities of super antioxidants, such as vitamin C and MB, serve to ensure that electrons are optimally distributed and repeatedly exchanged in redox**

**reactions throughout the body, which is the essence of optimal health.**

For those who appreciate metaphors, good nutrition is the product (electron) manufacturing facility, and the premier antioxidants (vitamin C and MB) are the trucks that assure the optimal distribution and delivery of those products throughout the country (body). Lots of electrons and only a few trucks limits its distribution throughout the body. While it is logical and correct that delivering the antioxidant in its reduced form brings even more electrons into the body, the oxidized form is also highly effective without those extra electrons, since it is the distribution and repeated give-and-take of electrons throughout the antioxidant matrix inside the cell that is of the greatest therapeutic value. A clear example of this is seen in animal studies, where dehydroascorbic acid (DHAA), the oxidized form of vitamin C, readily minimizes brain infarct size following induced ischemic stroke, facilitating rapid recovery. These studies also demonstrate a precipitous decline in reduced vitamin C in the ischemic brain, which is ***reversed*** by the infusion of DHAA.[2]

However, the presence of elevated blood levels of DHAA reported in patients with infectious disease does not mean DHAA is toxic *per se*. Instead, such elevated levels are merely a reflection of increased oxidative stress in the patient, not the cause of it.[3] Furthermore, any negative impact that DHAA has been reported to have in some *in vitro* studies does not reliably predict the positive effect that DHAA has in the intact plant, animal, or human, as such test tube studies are not receiving an ongoing new intake of electrons from quality nutrition or sun exposure.[4] Like the ascorbic acid and DHAA forms of vitamin C, the powerful clinical impact of MB appears equal whether administered in its oxidized (methylene blue) or reduced (leucomethylene blue) forms.

## Methylene Blue: A Brief History

Methylene blue was the first drug to be tested and used in humans. Chemically known as methylthioninium chloride, it was first synthesized in 1876 and used as an industrial dye. It was later found to be an excellent dye for staining both microbes and human tissues. In 1891, Paul Ehrlich discovered it to be highly effective as an anti-malarial agent. Notably, Ehrlich first coined the term "magic bullet" to describe the remarkable effectiveness of MB in targeting and accessing the nervous system.[5] It has since been established to have a selective affinity for the nervous system, although it is highly effective in reaching all cells in the body.

As a powerful antioxidant with the ability to easily reach the brain, MB was used as an antipsychotic drug for 50 years before phenothiazine became the first "official" antipsychotic drug.[6] It continues to be used as a dye for staining biological tissue specimens, as well as a diagnostic tool in surgical procedures.[7] It has also been established to have numerous and very significant therapeutic purposes for a wide range of medical conditions. Some of the more significant conditions to be consistently and successfully treated by MB include the following:

- ✓ Infections, from minimal to life-threatening, including those that have progressed to septic shock. Additionally, acute respiratory distress syndrome (ARDS) and hypoxemia secondary to COVID-19 or numerous other pathogens;[8-9] MB is also used for the disinfection of plasma to be given in transfusions[10-12]
- ✓ Mitochondrial dysfunction[13-15]
- ✓ Depression, dementia, psychosis, impaired memory, as well as multiple acute and chronic neurological conditions[16]
- ✓ Methemoglobinemia is a condition in which the oxygen-carrying capacity of the blood is critically depleted.[17] MB has FDA approval as a first-line therapy for this condition.[18-19]

## Extraordinary Properties of MB

An ideal antioxidant is equally stable chemically in both its reduced and oxidized states. It is not resistant to being re-oxidized or re-reduced, while having physical access to all the biomolecules in the body. Such a quality allows the continued exchange of electrons throughout the cellular and extracellular spaces, as the molecule does not resist being either reduced or oxidized. This redox (reduction-oxidation) property enables the conduction of electron flow within cells. This helps to generate and sustain the microcurrents (a current is an electron flow) that have been identified inside cells, which work to maintain healthy transmembrane voltages. A sick cell always has a low transmembrane voltage, which directly reflects a redox balance skewed toward oxidation, with a limited influx of new antioxidant (nutrient) molecules and new dietary electrons available to deal with any new pro-oxidant (toxic) molecules. Normal transmembrane voltages are critical in maintaining healthy ion channels, transporters, pumps, and enzymes in the cell.[20] They are also essential for the optimal synthesis of ATP.[21]

A toxin always works to cause oxidation wherever it ends up inside the body. It is always pro-oxidant in its chemical impact, as it seeks to oxidize a biomolecule and then ***keep*** the electron it has "stolen." The electron it acquires makes the toxin ***much more stable chemically***, and such a reduced toxin will not give up the electron again to another oxidized, or electron-depleted, biomolecule. This means that the electron-saturated toxin will never re-donate its electron to an oxidized biomolecule, as would occur with an electron-saturated, or reduced, antioxidant molecule. Unlike an electron-saturated antioxidant, an electron-saturated toxin retains the "stolen" electron permanently, and the electron pool becomes depleted as oxidative stress within the cell increases.

In addition to increasing the number of oxidized biomolecules, this retention of electrons by toxins also impedes electron flow (microcurrents), as the newly acquired electrons are tightly

held and never again released, unlike an antioxidant that continually gives and takes electrons. An antioxidant, such as vitamin C, decreases the total number of oxidized biomolecules and supports optimal microcurrents, whereas a toxin does the opposite.[22]

**The qualities of super antioxidants, such as vitamin C and MB, serve to ensure that electrons are optimally distributed and repeatedly exchanged in redox reactions throughout the body, which is the essence of optimal health.**

The antioxidant properties of MB are responsible for its impressive clinical impact on numerous conditions. In this regard, there is a striking parallel in what MB can do in the body with what vitamin C can do. Both vitamin C and MB are small molecules that effectively reach every cell in the body. However, MB requires neither active nor passive cell wall transporters, unlike vitamin C, and it exhibits both lipid-soluble and water-soluble characteristics. Because of this, MB passes easily through lipid-rich cell walls, after which it disseminates well throughout the water-based cytoplasm.[23-24] Additionally, while both MB and oxidized vitamin C can cross the blood-brain barrier, MB has been found to have a brain concentration up to ten times higher than in the serum, as quickly as one hour after intravenous administration.[25] Uptake is also very rapid in other organs.[26]

MB also has well-documented antitoxin properties, similar to those of vitamin C; however, the studies documenting these effects are significantly less numerous than those showing the similar effects of vitamin C on toxins and other poisons. MB helps protect the kidneys against the toxicity of the chemotherapeutic agent, cisplatin.[27] MB has also been shown to protect the brain against the toxicity of another chemotherapeutic agent, ifosfamide.[28-29] It was also shown to effectively treat the encephalopathy induced by ifos-

famide after it had developed. Although there is a lack of articles demonstrating the ability of MB to neutralize toxins and repair toxic damage, multiple researchers recommend that it be routinely available as an emergency antidote for general use.[30-31]

Many toxins also inflict harm in some individuals by forming methemoglobin, which reduces oxygen delivery to the tissues. Such toxin excesses or poisonings can be effectively treated with MB, as it is already the treatment of choice by many clinicians for methemoglobinemia. MB is often a beneficial partner to be administered in conjunction with vitamin C for the treatment of toxin excess or overdose.[32-33] The addition of magnesium with MB and vitamin C to overdose patients offers additional protection against the development of fatal arrhythmias that can occur before the MB and vitamin C can resolve and block further toxic impact.[34]

## Ideal Shock Therapy

Methylene blue is exceptionally beneficial for both general infections and hypotensive shock. This makes it a particularly optimal therapy for the prevalent cause of intensive care unit death around the planet: septic shock.

> **Refractory septic shock, a state of disseminated infection with vascular collapse and hypotension typically *unresponsive to all traditional measures*, consistently responds positively to MB therapy, sometimes saving the patient from otherwise certain death.**

As with vitamin C and many other non-traditional treatments, nearly all clinicians will not take the "leap" from clear-cut positive results in the literature to the application of those results in their patients. At best, they use these non-traditional therapies almost like a final gesture that they have done everything possible to save the patient, even though those therapies have little

to no toxicity and should not be relegated to the last option in a treatment protocol. And, of course, this only applies to clinicians who are even remotely aware of the data showing how effective and nontoxic these non-traditional therapies are in the first place. Many pearls in the medical literature remain largely unharvested by most clinicians. And many more clinicians are very diligent in doing everything possible to maintain the "mainstream status quo" to the point of ignoring and even suppressing anything that might threaten it.

**MB is often a beneficial partner to be administered in conjunction with vitamin C for the treatment of toxin excess or overdose.**

An experienced and honest clinician will tell you that just one dramatic case report that is accurately reported has enormous value. When a patient is on the verge of death despite all that has been done, and one single intervention quickly stops the clinical deterioration and starts a clear recovery, the conscientious clinician does not need a large, prospective, double-blind, and placebo-controlled clinical trial to take such a clinical response seriously. Such a trial would be ***unethical*** if the placebo group were not given the benefit of some inexpensive, nontoxic, and highly effective agent. Seeing a patient return to normal only a short time after a treatment is administered should always prompt serious attention, especially in the setting of an advanced and rapidly progressing infection with unresponsive shock secondary to sepsis.

A clear example of such a case was reported on a 38-year-old male patient who presented with bilateral pneumonia that subsequently worsened and resulted in bacteria (*Klebsiella pneumoniae*) being released into the bloodstream (septicemia). Lethargic with low blood oxygen when admitted to the hospital, he was given IV fluids with insulin and antibiotics. The oxygen levels continued to decline with increased difficulty breathing, and he was then

intubated and supported on a ventilator. Hypotension requiring vasopressor infusion ensued. Broader antibiotic coverage was added. Metabolic acidosis with declining renal function followed, and a few hours later, the patient had a cardiac arrest. Four hours after regaining a normal heart rhythm and 25 hours after initial presentation, extracorporeal membrane oxygenation (ECMO) support was initiated. Nevertheless, critically low blood pressure ***unresponsive*** to multiple vasopressors continued.

**...MB *enhances antibody production* in the body. This begs the question: Why not use MB *first* in such situations, rather than last, or never?**

At this point, a 172 mg IV bolus of MB was administered, and an infusion of MB at 0.51 mg/kg/hour was maintained for the next 10 hours. Blood pressure ***quickly improved***, and vasopressor support could be decreased. After the infusion, the clinical status stabilized for another 22 hours, but fever with a dropping blood pressure unresponsive to combinations of vasopressors at the highest doses returned. The MB infusion was restarted, and blood pressure ***responded promptly again***. This time, the infusion was continued for 54 hours, and about seven days after this more prolonged infusion was completed, the patient was fully recovered and discharged from the hospital.[35] Another impressive case report on a clinically similar patient showed that MB had to be continually infused for a full 120 hours to prevent repeated clinical relapses, after which the patient stabilized and was eventually discharged.[36]

These case studies, in which the patients effectively serve as their controls, demonstrated clear improvement in MB when severely ill, followed by rapid deterioration back to a life-threatening point after MB discontinuation, and prompt improvement with complete clinical resolution when MB was restarted and continued for a sufficiently long period. No sincere and compe-

tent clinician giving his/her highest priority to patient welfare would ignore the importance of such a clinical response when treating similar patients in the future. This is especially true when it is realized that MB, when dosed appropriately, has an impeccable safety profile, just like vitamin C. Also, like vitamin C, MB ***enhances antibody production*** in the body.[37] This begs the question: Why not use MB ***first*** in such situations, rather than last, or never?

Multiple studies have demonstrated the benefits of MB in stabilizing and even resolving septic shock, which is the worst stage that any infection can reach before the inevitable progression to death. No reports of MB worsening the overall clinical status of septic patients could be found. Studies show that MB consistently improves hypotension when administered appropriately. Furthermore, it has been demonstrated that MB improves survival in shock from ***all*** causes (vasodilatory shock), including the shock of advanced sepsis.[38]

Refractory hypotension (a condition where low blood pressure persists despite appropriate therapeutic measures that typically correct it) in septic shock is consistently observed in the setting of excessive nitric oxide production, which leads to an overly pronounced decrease in vascular tone.[39] MB promptly counteracts this and restores normal blood pressure.[40] Furthermore, over 120 years of MB use have established that there is no significant toxicity. Toxic levels exist, as with nearly every other agent (including water), but the amounts needed are far beyond the recommended dosing in established treatment protocols.[41-43]

An open-minded clinician reviewing the literature for the first time to learn about the best treatment for septic shock would utilize methylene blue as a first-line agent. Even low doses of MB and one-time boluses of MB consistently show clear benefit in septic shock. However, the clinical response is much better and more consistently achieved with a properly dosed continuous

infusion.[44-45] Septic shock still claims a lot of lives regardless of the therapy, and some clinical studies add MB seemingly as a last-ditch afterthought, after which MB is then reported to be ineffective for improving survival. And even now, some of the most recent clinical research continues to assert that "more studies are needed" on the impact of MB in septic shock, even though the very positive research on MB and septic shock now spans ***decades***.[46-55] Infusions of MB in hypotensive neonates have also been shown to increase blood pressure rapidly and safely.[56-58]

The impact of MB on septic shock was addressed above in some detail since a patient cannot be much sicker than having severe hypotension with massive infection and enormously increased oxidative stress throughout the body. However, it is essential to recognize that MB has also been demonstrated to be highly effective in treating various types of hypotensive shock unrelated to advanced degrees of infection.[59] Shock with unresponsive hypotension secondary to the ingestion of multiple drugs has responded rapidly to MB infusions, allowing the weaning of other vasopressor agents.[60-61]

**...it has been demonstrated that MB improves survival in shock from *all* causes (vasodilatory shock), including the shock of advanced sepsis.**

Shock secondary to anaphylaxis also responds well to MB.[62] One patient with profound refractory hypotensive shock following a dihydropyridine calcium channel blocker overdose only reacted positively to MB infusion and was eventually discharged. Before the MB infusion, no improvement in blood pressure was observed with saline infusion, several doses of calcium gluconate, glucagon, various vasopressor agents, and even high-dose insulin euglycemic therapy over several hours.[63] Another type of hypotensive shock, cardiac vasoplegia, is also sometimes seen following cardiac surgery. This is effectively treated by methylene blue as well.[64-66]

> **All forms of hypotensive shock should be treated with MB, and it should be included in the treatment protocol from the *outset*. It should not just be held back as a last-ditch intervention to save the patient.**[67]

Regarding ARDS secondary to COVID, a massive production of pro-inflammatory agents, known as a cytokine storm, typically precedes imminent death if not effectively terminated and neutralized.[68-69] MB has been ***uniquely*** shown to inhibit the production of all three major classes of pro-oxidants involved in the cytokine storm clinical picture (reactive oxygen species [ROS], reactive nitrogen species [RNS], and cytokines).[70-72] And as a potent antioxidant, MB is highly effective in neutralizing the vast array of pro-oxidants that have already been produced in the ARDS lungs. MB also combines well with other antioxidants in providing clinical benefits. MB, combined with vitamin C and N-acetylcysteine, was very effective in treating advanced COVID-19.[73]

Furthermore, patients who were severely ill with COVID but showing a steady clinical recovery still greatly benefit from MB. Many "recovered" COVID patients have significant neurocognitive problems that were lessened or even blocked with adequate dosing of MB. With the known antioxidant properties of MB, along with its predilection for targeting increased oxidative stress in the nervous system, it should be part of any COVID-19 treatment, ***regardless of how well the infection responds to other therapies***.[74-75]

## MB, Pathogens, and Photodynamic Therapy (PDT)

Logically, considering its documented impact on advanced septic shock, MB has also been shown to readily kill and/or neutralize a wide range of pathogens. While it can achieve this as a monotherapy, its effectiveness is further enhanced when combined with photodynamic therapy (PDT). A protocol using MB with

PDT has even been shown to eliminate intracellular pathogens such as prions from the blood.[76] Another MB/PDT approach has demonstrated a rapid resolution of moderate to severe COVID-19 in patients who did not require hospitalization.[77] MB has been shown to directly inhibit the initial binding of the COVID spike protein with the ACE2 receptor, a step necessary for the virus to enter the cell.[78-80]

MB and PDT have similar abilities to enhance mitochondrial function. Inside the mitochondria,

> **They both effectively bypass much of the Krebs cycle, producing normal amounts of ATP *while generating less oxidative stress* in the process of going through the entire cycle.[81] This can result in a complete clinical recovery from mitochondrial dysfunction syndromes.**

ATP is produced in the mitochondria due to the shuttling of electrons through the four sequential complexes of the electron transport chain. The fourth complex transfers electrons to the terminal electron acceptor, oxygen, ultimately resulting in the production of ATP. MB receives the electrons from the first complex and then directly passes those electrons on to cytochrome c in the fourth complex, bypassing the other complexes.[82] PDT with photons from near-infrared light also energizes and enables cytochrome c to donate electrons to oxygen, resulting in the production of ATP.[83-84]

This bypassing of the earlier complexes of the electron transport chain lowers the production of reactive oxygen species (ROS) that would have been generated by those complexes, decreasing net oxidative stress in the cell. Yet, ATP production continues as though the entire electron transport chain were functioning normally. Reducing ROS production (mitochondrial oxidative stress) while achieving normal energy production goals is always a

desirable yet rarely achieved therapeutic goal, and MB helps accomplish this.[85-86] Due to these effects, MB has been promoted as an anti-aging agent.[87] In cultured fibroblasts, MB extends the life span of these cells.[88]

**All forms of hypotensive shock should be treated with MB, and it should be included in the treatment protocol from the *outset*.**

When the mitochondria can be made more efficient in producing energy, every metabolic process in the body is positively impacted. Any of the mitochondrial dysfunction conditions can benefit from MB and PDT, but especially MB due to its antioxidant properties and the ability to be taken regularly in a supplemental form without requiring multiple light therapy applications. Furthermore, the actions of MB or PDT can also help restore an electron transport chain that has accumulated too much oxidative damage to function with normal efficiency (mitochondrial dysfunction) by decreasing the pro-oxidants (ROS) usually generated during the process of making ATP.[89]

However, there is no need to enhance every MB treatment with PDT to get optimal benefit if the MB is properly dosed. MB has been shown to inactivate a vast number of viruses and other pathogens *in vitro*, with and without PDT.[90-96] MB is especially well-suited to dealing with viral infections, as it works

- ✓ ***directly*** against the virus, and
- ✓ ***prevents*** virus entry into cells, and
- ✓ ***inhibits viral replication*** after the virus enters the cell.[97]

As might be expected, the ability of MB to resolve viral infections indicates its likely positive impact in preventing viral infections as well. During the first wave of COVID-19 infections in France, a cohort of 2,500 end-stage cancer patients treated with a protocol that included 75 mg of MB three times daily reported ***no*** cases of influenza or COVID.[98]

There is significant research into methylene blue derivatives, which are also highly effective antiviral agents, including against viruses in the smallpox family.[99] Similarly, as MB is of clear-cut benefit in patients with depression, MB derivatives are being evaluated for the treatment of depression and other neurological disorders.[100] Undoubtedly, the pharmaceutical industry recognizes the incredible abilities of MB, and considerable effort is being invested in finding related and effective agents that can be patented to generate substantial and exclusive profits.

## MB and Cancer

On the PubMed website, the entry "cancer methylene blue" yielded more than 2,700 references as of January 2025. The articles that appeared primarily address the role of MB in:

- ✓ Localizing (staining) of cancerous tissues and/or identifying as many involved lymph nodes as possible.[101-105]
- ✓ The inhibition, inactivation, or killing of a wide array of different cancer cells ***in vitro***, with and without the application of PDT.[106-113]
- ✓ The superiority of MB in treating tumors in mice over traditional chemotherapy[114]
- ✓ In combination with PDT, the complete resolution of AIDS-related Kaposi's sarcoma skin lesions that had been unresponsive to chemotherapy with MB and toluidine blue[115]
- ✓ The direct treatment of cancer in dogs[116]
- ✓ The direct treatment of cancer in humans (only one article). While treating different types of cancer, the author asserted that MB reliably alleviated pain secondary to cancer, improved overall health, and added years to longevity. This was reported in ***1907***![117] Another article stated that MB was found to have anticancer effects over a century ago.[118] Notably, no studies on clinical

applications of methylene blue in cancer patients were reported, except for the 1907 study cited above.

The efficacy of an inexpensive and safe agent like MB in various medical conditions, including even advanced ones, makes it an ideal general add-on or stand-alone treatment. Furthermore, its potent anti-cancer effects ***in vitro*** make it especially puzzling why straightforward clinical studies on cancer patients with MB alone or in combination with other agents have not been reported. Even the positive effects of the much-ignored vitamin C on cancer patients have been published in numerous articles. Yet, the remarkable properties of MB have been known for much longer than those of vitamin C. The literature even suggests that MB could play a positive role in the treatment of cancer patients, but for unclear reasons, studies documenting that positive role have yet to appear in PubMed.[119]

## MB: Safety and Dosing

The main "side effect" of MB is a blue or green discoloration of the urine. Rarely, some blue discoloration of the skin may be noticed with prolonged administration of a very high dose of MB. Nevertheless, both effects are completely reversible in hours to a few days as the MB is eliminated from the body. At very high doses of MB, some of the hemoglobin in the blood can be converted into methemoglobin, a condition characterized by an abnormal state. In this case, MB is the treatment of choice when given at a lower dose. Even higher doses can result in greater toxic side effects. However, even the high doses used for some critically ill patients who are not responding to other measures will not reliably result in toxicity. Virtually, MB is entirely nontoxic, even when doses far above the recommended dosing are taken chronically. Also, in patients with depression who are on drugs known as selective serotonin reuptake inhibitors (SSRIs), the addition of MB is not advisable, as some of these patients can develop a potentially life-threatening condition

known as serotonin syndrome.[120-121] However, MB is frequently an effective antidepressant in its own right at low doses.[122]

Because they are highly effective antioxidants, both MB and vitamin C have been cited to rarely precipitate red blood cell hemolysis in patients with glucose-6-phosphate dehydrogenase (G6PD) deficiency. Nevertheless, the proper administration of these agents in such patients typically avoids such hemolytic problems. When a G6PD-deficient patient presents with methemoglobinemia, a condition for which MB is generally the indicated treatment, properly dosed vitamin C can resolve the condition without the need for MB.[123-124] Notably, G6PD deficiency, which can lead to hemolytic anemia, is very rare with the use of MB. In African children with malaria, MB therapy was shown to be very safe even when G6PD deficiency was present, as was the case with all 24 deficient children in one study.[125] Another study on 74 healthy but G6PD-deficient adult men demonstrated no hemolysis when they were given MB along with chloroquine.[126]

**Furthermore, its potent anti-cancer effects *in vitro* make it especially puzzling why straightforward clinical studies on cancer patients with MB alone or in combination with other agents have not been reported.**

Generally, intravenous dosing is not necessary except for the critically ill patient, as in advanced hypotensive shock. There is no standard, fixed regimen of MB recommended in such situations. Boluses of 2 mg/kg of MB can be administered, often followed by infusions of varying durations, depending on the patient's clinical status and response. Such infusions are usually administered at a rate of 0.5 mg MB/kg/hour over an extended period, but as much as 4 mg MB/kg can be infused within an hour. An effective infusion

spanning 120 hours has been reported. Others report that infusions can range from 0.25 to 2 mg MB/kg/hour.[127-128]

For less critical patients, as well as for outpatients, oral MB dosing can range from 5 mg to 50 mg, and this dosage can be taken one to three times daily, with the dose size and frequency adjusted up or down depending on the clinical response. Even higher doses can be used comfortably for limited periods. 200 mg daily to stabilize COVID patients who are not yet critically ill is a very reasonable dose. A reasonable daily supplementation dose can range from 5 to 25 mg for general good health, provided there is no targeted symptom or medical condition.

As a practical point regarding regular supplementation, a dose of 5 to 25 mg of 1% MB solution (0.5 to 2.5 milliliters) can be added to a small amount of water or even taken directly with a dropper as far back on the tongue as possible. Any blue staining of the tongue resolves, but a skin stain could persist for days. Prompt rubbing of the affected skin area with disinfectant alcohol or 3% hydrogen peroxide can eliminate the stain if done promptly. Regardless, the staining still reliably resolves. Oral tablets containing MB can also be used.

## Recap

Methylene blue (MB) is an antioxidant with high redox activity, able to rapidly "oscillate" between its oxidized and reduced forms, much like that seen in vitamin C. A small molecule with both fat- and water-soluble characteristics, it reaches all areas and cells of the body, concentrating primarily in the brain and central nervous system. Like vitamin C, MB is highly effective in maintaining a healthy distribution of electrons already present in the body, as well as the distribution of new electrons assimilated from the nutrients in a balanced dietary regimen.

MB has a unique ability among antioxidants and other biomolecules to relay electrons from the first complex in the energy-generating electron transport chain in the mitochondria directly to the fourth complex. This allows the energized fourth complex to then produce ATP without the additional expenditure of energy in the steps of the electron transport chain that was bypassed. As such, MB allows dysfunctional mitochondria to produce healthy levels of ATP while producing less oxidative stress in the process, an optimal way to heal those mitochondria, which further promotes general healing. Photodynamic therapy (PDT) can also directly activate the energy production of the fourth complex in the electron transport chain.

Like vitamin C, MB is also a very powerful antipathogen. It has been documented to salvage even late-stage COVID patients supported on ventilators with hypotension secondary to septic shock. For viruses in general, MB has the unique ability to attack the circulating virus, block its binding to the body's cells, and prevent the virus from proliferating inside the infected cell. When administered as recommended, MB is exceptionally well-tolerated, with a safety profile that spans over 100 years of clinical use.

# Section Three

## Designing Optimal Treatment Protocols

## Chapter 16

*Doctors put drugs of which they know little into bodies of which they know less for diseases of which they know nothing at all.*

Voltaire

# Foundational Treatment Principles & Modalities

## Treatment Protocol Objectives

All treatment protocols must have a significant antioxidant or antitoxin impact, and most of them should be equipped to deal with overt or unsuspected infections. The widespread presence of PSP (persistent spike protein) globally makes it crucial to carefully monitor all clinical and laboratory abnormalities and subsequent improvements or normalizations.

The bio-oxidative therapies are especially important. Among these therapies, one of the simplest is the application of hydrogen peroxide via nebulization. This eliminates many infections before they have a chance to take hold, as well as many infections that are already in an advanced stage. Also, chronic pathogen colonization [CPC] (usually asymptomatic) in the nose, throat, and respiratory tract is readily resolved with HP nebulization. As CPC plays the

major role in causing a leaky gut with a pathogen-ridden microbiome, HP nebulization should always be at least an early part of any treatment protocol for any condition.

**Except under very rare circumstances, calcium, iron, and copper should *never* be supplemented. In the case of calcium, a high daily intake of certain dairy products can also be very harmful.**

Most vitamins, minerals, and other nutritional supplements can be consumed in high doses without resulting in significant clinical toxicity. However, this is not always the case, and it is crucial to be aware of the circumstances under which minimal added intake of specific nutrients in supplement form can be a negative factor in achieving and maintaining long-term health.

Except under very rare circumstances, calcium, iron, and copper should ***never*** be supplemented. In the case of calcium, a high daily intake of certain dairy products can also be very harmful. All three of these "toxic nutrients," while necessary at low levels of intake for the health of all cells, rapidly become major factors in undermining the health of those same cells with only ***minimal*** degrees of added intake.

Iron intake is especially problematic, as so many people are getting continually "supplemented" with iron, typically in the form of metallic iron filings, whenever they eat any of a large variety of common foods that have been "enriched." As this "enrichment" has been around for nearly 80 years now, along with the fact that most people cannot afford purer, organic foods and products, most individuals in the developed world are in a state of chronic iron excess throughout their bodies unless they are still very young or are chronically losing enough iron through menstruation. No person who regularly consumes iron-added foods has a normal gut and microbiome due to the chronic oxidative stress inflicted on all parts

of the gut when swallowing and digesting these iron-laden foods. Awareness of this chronic iron poisoning of the food supply and the diligent reading of all "Ingredients" food labels can eliminate this particular toxin exposure.

Poor digestion represents a significant source of toxin exposure throughout the bodies of many individuals. Unless properly addressed, many medical conditions will not respond well until digestion can be improved. A sufficiently pathogen-ridden microbiome, along with a leaky gut, will keep those affected individuals sick for life.

## First Step: Elimination of Toxin Exposures

A complete understanding of the pathology involved in any disease or medical condition is essential for constructing an optimal treatment protocol. While traditional medicine broadly aspires strictly to relieve the symptomatology of a medical condition, optimal therapy aims to stop and even reverse the underlying disease pathology while lessening or eliminating any associated symptoms. This is the guiding principle of orthomolecular medicine, which strives to identify and correct all identifiable vitamin, mineral, and nutrient deficiencies. No disease exists without the presence of such deficiencies, which all reliably magnify the cellular oxidative stress involved in any disease.

As toxins cause all disease, an optimal approach to the treatment of any medical condition must involve:

- ✓ Identifying the sources of new toxins, whether environmental or internal,
- ✓ Eliminating environmental exposures to molds, toxic chemicals in the home, in your water, or in/on your food. This includes a cessation of potentially toxic nutrient supplementation (see Chapter 3),
- ✓ Stopping toxin production that is occurring in the body (see Chapters 2 and 17),

- ✓ Blocking new toxin damage and repairing old toxin-induced oxidative biomolecule damage,
- ✓ Providing optimal immune and hormonal support for dealing with toxin neutralization, and
- ✓ Eliminating accumulated toxins in as nontoxic a fashion as possible.

As most new toxins originate from pathogen metabolism, it is always advisable to implement pathogen eradication measures for any condition, since pathogen sources are often difficult to identify. Many of the treatment measures to be discussed have both anti-pathogen (antibiotic-like) properties and antitoxin properties.

## Optimal Treatment Protocols

Regardless of the condition, toxin, or infection, affected cells can only recover and return to a state of normalcy when elevated intracellular levels of oxidation (as oxidized biomolecules) are returned to normal, physiological levels. This is only accomplished when cellular levels of calcium, magnesium, vitamin C, glutathione, and ATP are restored to their optimal ranges. While multiple interacting factors are always at play in cellular physiology, sex hormones, thyroid hormone, cortisol, and insulin play critical roles in maintaining and restoring intracellular health.

Many of the direct relationships among these nine factors have been discussed. None of these factors function in isolation, and attention should be made to address as many of them as possible. Hormone deficiencies should always be restored to as normal a status as possible, in addition to correcting the levels of calcium, magnesium, vitamin C, glutathione, and ATP.

## Bio-Oxidative Therapies

While any therapy that can eradicate an infectious agent must involve the agent's destruction via enhanced oxidation, the most prominent of these therapies involves the appropriate application of:

- ✓ Vitamin C (multiple modalities)
- ✓ Hydrogen peroxide (various modalities)
- ✓ Ozone (various modalities)
- ✓ Ultraviolet blood irradiation (multiple protocols)
- ✓ Hyperbaric oxygen

Although still not widely appreciated, these bio-oxidative therapies have been used to cure acute infectious diseases for many years. And since infections are the source of most new toxins, these can also be effectively considered antitoxin measures much of the time. The resolution of acute viral infections has been well established to result from any of these therapies, administered individually or in combination. All these therapies share the ability to rapidly increase oxidative stress within the pathogens themselves and/or within the cells that have become infected with the pathogens. A pathogen or pathogen-infected cell can only be destroyed when intracellular oxidative stress reaches a sufficiently high level. And even though different treatments might have unshared mechanisms in fueling this increased oxidative stress, it is this singular effect that ultimately resolves the infection.

### Vitamin C

Vitamin C (VC), which interacts directly with intracellular hydrogen peroxide [$H_2O_2$] (HP), works to eradicate pathogens, including the COVID-19 pathogen, through a mechanism known as the Fenton reaction. This reaction produces hydroxyl radical formation in a pathogen or a pathogen-infected cell, which works to oxidize whatever it is next to when it is formed. This ultimately

destroys the pathogen, whether inside or outside the cell, when sufficient VC and HP are present. For more detailed information on VC, see Chapter 12.

**Regardless of the condition, toxin, or infection, affected cells can only recover and return to a state of normalcy when elevated intracellular levels of oxidation (as oxidized biomolecules) are returned to normal, physiological levels.**

Enough HP by itself will also quickly oxidize pathogens and their infected host cells. This can occur with HP nebulization, the direct ingestion of appropriately dosed HP, and the proper intravenous infusion of hydrogen peroxide. Intravenous HP has long been established as a powerful anti-viral therapy, curing many of the most critically ill patients in the 1918 influenza pandemic.[1] HP nebulization is especially effective in clearing out areas of chronic pathogen colonization in the nose and throat. Even though such areas are usually asymptomatic, they make these "virus-manufacturing" areas of the body much more susceptible to the contraction of new infectious agents, whether viral or otherwise.

The nature of the immune system provides further support for the roles of both VC and HP in controlling and resolving infections. Monocytes and phagocytes are the first cells to appear at new sites of inflammation or infection during the immune response. Notably, these two types of immune cells contain exceptionally high levels of VC, HP, and magnesium. This results in the immediate delivery of the most critical elements of the pathogen-killing Fenton reaction to the new site of infection.[2-6]

## General Guide for the Administration of Hydrocortisone with Vitamin C

The importance of vitamin C in cellular health, combined with the epigenetic defect in the liver that prevents the regular

and normal synthesis of this vitamin in the body, mandates that ***multigram daily doses of vitamin C*** be part of everyone's supplementation regimen. Optimal health can ***never*** be achieved and maintained on the minuscule daily "recommendation" of 75 to 90 mg of vitamin C for women and men. Optimal daily intake is much closer to amounts that are more than ***100-fold*** (10,000%) greater than these ridiculous recommendations. Furthermore, the amounts of vitamin C required during periods of advanced oxidative stress can be more than ***1,000 times*** (100,000%) more than the recommended amounts.[7]

While a clinical goal of normalizing health and returning abnormal laboratory tests to normal can often be achieved with many different approaches to vitamin C supplementation, several clinical circumstances do not readily normalize with just vitamin C. Still, they would always benefit significantly from the addition of hydrocortisone to optimize intracellular vitamin C levels. Nevertheless, clinical cures might still occur for some conditions with the addition of hydrocortisone that were not achievable with vitamin C (and other nutrients) alone.

> **The impaired ability of many patients to produce sufficient cortisol in response to all oxidative challenges underlies many therapeutic failures or suboptimal responses, even with substantial amounts of vitamin C being administered.**

Furthermore, the appropriate addition of hydrocortisone to a vitamin C treatment protocol at the outset saves otherwise wasted steps in optimizing intracellular health as quickly as possible. ***Any of the recommendations described below should be administered and followed under the guidance of a qualified healthcare practitioner***. These recommendations can always be ***added*** to any other recommendations in a treatment protocol, whether for an acute or chronic condition.

### For acute infections and/or toxic challenges

When intravenous vitamin C is an option: For 25 to 50 gram vitamin C infusions, 20 to 100 mg of hydrocortisone can be added to each infusion (or given as an IV push after infusion is started); lesser amounts of vitamin C (7.5 to 25 grams as an infusion or even as an IV push) can still be given with a total of 25 to 50 mg of hydrocortisone in the syringes as well (for more details regarding the advantages of administering hydrocortisone in conjunction with vitamin C, see Chapter 11). If only oral hydrocortisone is available, 20 to 100 mg can be given orally approximately one hour before the vitamin C infusion or IV push is administered. Such timing attempts to synchronize the peak blood levels of hydrocortisone and vitamin C. This approach can be continued until the acute infection (usually a week or less) is resolved. If the infection is significantly improved but not completely resolved, 20 mg of hydrocortisone can be administered with the first morning dose of oral vitamin C for an indefinite period. More than 20 mg of hydrocortisone daily should not be given indefinitely unless the patient has a diagnosis of severe adrenal insufficiency (Addison's disease). Then, as much as 40 mg of hydrocortisone can be given daily for life.

> **However, there should be no fear of worrisome "steroid side effects" when giving 100 to 200 mg daily of hydrocortisone in divided doses for only one to two weeks to stabilize and/or resolve an advanced toxic or infectious condition. Severely challenged but normal adrenal glands can increase daily cortisol production to as much as 100 mg.**

When intravenous vitamin C is not an option, 5 to 15 grams of liposome-encapsulated vitamin C can be given orally, and/or 4 to 6 grams of ascorbic acid or sodium ascorbate powder (rounded to a heaping teaspoon) in water or juice can be sipped on over an extended period. This can be repeated several times a day, based on

the clinical response. Other forms of oral vitamin C can be similarly dosed. The first morning dose of vitamin C can be accompanied by 5 to 20 mg of hydrocortisone orally. It is best not to exceed a cumulative daily dose of 20 mg of hydrocortisone if this oral option is intended to be continued for months or indefinitely. Also, limit hydrocortisone to morning and possibly midday dosing, as dosing close to bedtime can make it difficult to fall asleep.

### For chronic infections and chronic diseases

It is optimal for patients in this group to undergo testing to determine their baseline and stress-related blood cortisol levels. This establishes the underlying capacity of the adrenal glands to produce cortisol under both baseline conditions and circumstances of acute oxidative stress. While everyone can benefit from the vitamin C-hydrocortisone combinations being presented, this testing can help identify more accurately those patients who most need this kind of antioxidant/hydrocortisone support on an ongoing basis. Optimizing intracellular vitamin C must be a lifelong therapeutic goal. If someone with an acute infection consistently has a low or even normal (not acutely elevated from the infectious stress) level of cortisol first thing in the morning, lifelong supplementation of a tailored amount of hydrocortisone, along with vitamin C, should be considered.

**Many patients without advanced infections or chronic diseases can still benefit from simply taking 5 to 20 mg of hydrocortisone orally with their morning dose of vitamin C.**

As caring for patients with chronic infections and chronic diseases is highly individualized, there can be no fixed recommendations. Availability, convenience, and expense are key factors that determine how frequently someone can receive vitamin C infusions. When this is an early part of a long-term treatment protocol, the recommendations noted for acute infections can be employed. After a couple of weeks, the oral vitamin C/hydro-

cortisone approach can be adopted. When vitamin C infusions are given intermittently but indefinitely, as one or more times a month for a cancer patient, hydrocortisone can always be added in a sizable dose.

Many patients without advanced infections or chronic diseases can still benefit from simply taking 5 to 20 mg of hydrocortisone orally with their morning dose of vitamin C. However, proper hydrocortisone/vitamin C dosing can only be achieved with the guidance of a physician or other healthcare professional who closely monitors the clinical response and serial blood testing of a given patient, and who can prescribe oral hydrocortisone tablets. ***The potential variations in the application of vitamin C with hydrocortisone are numerous***.

Remember that the combined administration of vitamin C and hydrocortisone is the ONLY way to assure that a given patient can optimize their immune system response to any disease, infection, or toxin, whether presenting acutely or chronically, since an optimal response mandates that intracellular vitamin C levels have returned to normal. If normal cellular vitamin C levels cannot be achieved, a healthy cell cannot be realized.

## Clinical Applications of Vitamin C

(see Chapter 12)

### Giving VC with Various Therapies

Here are some key principles to keep in mind when incorporating vitamin C into your protocols. Vitamin C:

- ✓ Enhances the effects of most other therapeutic agents and interventions, including antibiotics, except for pro-oxidant therapies.
- ✓ Generally, it should not be administered simultaneously with pro-oxidant agents, including most chemotherapeutic agents, as it could neutralize the benefits of both.

- ✓ However, before the use of pro-oxidant therapies, vitamin C can be administered to shield normal cells from pro-oxidant damage. VC can also be given afterward to repair the damage.

### Enhancing Impact with Multi-C Protocols

While there is no single, definitive way to optimize the therapeutic effects of vitamin C, administering two or more forms of vitamin C can significantly enhance its impact. Here are some suggestions:

- ✓ Liposome-encapsulated VC taken orally can enhance intracellular delivery and targeting to subcellular organelles, such as the mitochondria.
- ✓ Ascorbic acid or sodium ascorbate powder taken orally in multigram doses several times daily, up to or reaching bowel tolerance, can help load the gut's immune cells with vitamin C and support its extracellular delivery.
- ✓ Oral ascorbyl palmitate taken orally improves antioxidant status in fatty tissue and nervous system tissues, including the cell walls.
- ✓ Intravenous vitamin C administered as an IV push, rapid infusion, and/or prolonged infusion quickly optimizes toxin neutralization in the extracellular areas of the body. Ultimately, much of the extracellular VC is taken into the cells. Adding insulin, hydrocortisone, and/or magnesium will substantially facilitate the intracellular delivery of vitamin C.
- ✓ Intramuscular injections of vitamin C can serve as an alternative to IV administration when IV administration is not feasible.
- ✓ Olive leaf extract can deliver hydroxytyrosol supplementation, which can help overcome the epigenetic defect in the human liver that blocks VC's internal synthesis. Metadichol®, a

nano lipid form of policosanol, can significantly upregulate internal vitamin C synthesis as well.

### Treating "Die-Off" with Mop-Up IVC

An IVC infusion rarely initiates a Herxheimer reaction or Herxheimer-like adverse reaction due to one of the following conditions:

- ✓ Massive kill-off of pathogens
- ✓ Accelerated release of stored intracellular toxins
- ✓ Massive kill-off of susceptible cancer cells

A "low and slow" mop-up VC infusion can be used to resolve the issue. Here are a couple of possibilities:

1. Slowing the infusion rate by approximately 75% when 25% to 50% of the IV fluid remains often allows the patient to feel well by the end of the infusion period.
2. When the patient feels poorly and the primary IV is almost complete, just giving five more grams over an hour or so can satisfactorily resolve the detox reaction.

## Hydrogen Peroxide (HP)

Most people, including physicians, regard HP as an effective disinfectant capable of eliminating pathogens from external surfaces or wounds. HP has been documented to readily kill all pathogens against which it has been tested, including viruses, bacteria, and fungi, whether inside or outside the body. Some pathogens require a higher concentration and longer exposure time to HP to be killed; however, all have been documented to succumb.[8-11]

Nevertheless, traditional medicine generally opposes the use of HP by any route into the body to address infections or pathogen colonization. When one considers that the definition of a disinfectant typically applied is that of an agent used to destroy patho-

gens on an external surface, it is understandable that any internal application of a substance would be assumed to be inappropriate and even toxic. And since HP is technically a disinfectant with widespread applications in killing pathogens outside the body, it is just assumed by many that it would also be highly toxic to the body's cells if used in any internal application. Scientific arguments are never used in opposing the internal clinical applications of HP. Rather, the opposition is based on ridiculous assertions that any agent with disinfectant and/or bleaching capabilities can never be administered inside the body, as it must be inherently poisonous. And, of course, for many such cleaning agents, this is correct. But for hydrogen peroxide, this assertion is not even remotely valid. Quite the opposite is true.

**HP is a naturally occurring antibiotic "designed by nature" that gives the body its best chance of preventing an infection or resolving one once it has been contracted.**

There are a few molecules in the body that are singularly more important for optimal health than HP. It is essential for the ongoing defense against pathogens throughout the body, while also playing a pivotal role in regulating normal metabolism. HP is continually generated both inside and outside of all cells in the body.[12-13] HP is a naturally occurring antibiotic "designed by nature" that gives the body its best chance of preventing an infection or resolving one once it has been contracted.

HP is also intimately involved in vital messaging and signaling functions between different cells, as well as within individual cells, to maintain normal metabolic function. Furthermore, HP is present in the body in significant ***amounts***, with some data indicating that as much as 5% of new oxygen intake is utilized in the generation of HP.[14] An extremely simple molecule, HP presents no toxicity to the body except when administered in very high doses and concentra-

tions, conditions that can render any substance toxic. However, at the low concentration levels discussed here, it is ***completely nontoxic***. Even the best pharmaceutical drugs continue to harm and kill. Over 100,000 Americans die annually due to the toxicity of prescription drugs, ***properly dosed and administered*** for various conditions. Nobody dies, or even gets ill, from hydrogen peroxide applied at its established, therapeutic concentrations.

**...HP serves as a central regulating molecule in the body, capable of promoting either a pro-oxidant or antioxidant impact, depending on the "microenvironment" in which it is found at any given time.**

HP is a tiny nonionic molecule that readily crosses the membranes of both pathogens and cells in the body. HP is present everywhere in the body, both within cells and in the extracellular spaces.[15] The normal physiology of the body involves the continual generation of HP throughout the body. Although technically considered a reactive oxygen species (ROS) molecule with chemical instability, HP is quite stable and not prone to oxidize surrounding molecules except when certain local conditions exist, as is present in acute and chronic infections.[16]

It would be more accurate to consider HP as a "ROS-in-waiting." By itself, it is largely nonreactive, but it is ready to promote pro-oxidant impact when called upon. Increased pro-oxidant activity is critical for killing pathogens, but this activity is undesirable within healthy cells. The "standby" ability of HP to become pro-oxidant only when needed accounts for its unique cell-protective properties. Furthermore, it is crucial to recognize that an increased presence of HP can also trigger responses that limit or ***repair*** oxidative damage. This further reinforces the concept that HP serves as a central regulating molecule in the body, capable of promoting either a pro-oxi-

dant or antioxidant impact, depending on the "microenvironment" in which it is found at any given time.

Pathogens have high levels of reactive (unbound) iron inside them. The process of electron relay from ferrous iron (Fe2+) to HP inside the pathogen-filled cells or the invading pathogens themselves forms the highly destructive oxidizing agent known as the hydroxyl radical. This is called the Fenton reaction.[17] Continued hydroxyl radical formation quickly kills pathogens and also readily destroys the cells that are already heavily laden with pathogens. Intracellular ionic copper also fuels the production of hydroxyl radicals in a similar fashion. This hydroxyl radical is regarded as the most reactive pro-oxidant known to exist, as it never accumulates or migrates, immediately oxidizing whatever is next to it at the moment of its formation.[18]

Because of this ability of HP to generate hydroxyl radicals in iron-filled pathogens, it serves as a primary way in which the body mounts a natural defense against infection. ***In every sense of the word, HP is the body's natural antibiotic***. Greater degrees of infection and inflammation have been shown to stimulate and increase the generation of HP.[19] Activated phagocytes responding to a site of infection and inflammation naturally generate massive amounts of HP into the extracellular space to help deal with the pathogens.[20-21] Interestingly, phagocytes have high concentrations of vitamin C, which can help supply electrons to HP via the free iron present, allowing for the formation of hydroxyl radicals. Also, vitamin C has been established to help generate increased amounts of extracellular HP for uptake into the infected cells for better pathogen-killing.[22-23]

Furthermore, as one might expect from a natural defense mechanism, the byproducts of HP that result from its normal metabolism and anti-pathogen effects are completely nontoxic, in striking contrast to virtually all prescription agents used to treat infections. When HP has been metabolized, only water and oxygen

remain. Because of its composition ($H_2O_2$), HP is an ***effective storage form of oxygen***, waiting for the proper microenvironment in which to release it. This means that HP can kill pathogens and improve the healing capacity of any tissue that was damaged while the pathogens were proliferating there, utilizing the water and oxygen that remain. Many people who nebulize 3% HP for more than a minute will experience a 1% to 3% increase in blood oxygen saturation levels, as measured by a pulse oximeter.

In a normal, uninfected state, pulmonary epithelial cells—the cells lining the airways of the lungs—naturally excrete and express HP.[24] This process puts a fine coating of HP on the exposed side of these cells, helping to protect the lungs from any new pathogens contained in every breath. Of note, when inflammation and infection are already present, increased amounts of HP are found in the exhaled breath.[25] This is consistent with a natural compensatory mechanism that helps contain the infection and prevent it from spreading. HP has also been documented to be present in human urine, where it can also provide its anti-pathogen effects.[26] The ubiquitous and essential role of HP in the body is further underscored by its vital function as a signaling molecule in both intracellular and extracellular spaces, directly influencing and modulating multiple metabolic processes.[27]

In addition to its presence throughout the body, both inside and outside cells, HP is also found in drinking water, rainwater, and seawater. It is also assimilated from the diet. The relationship between HP and water, as well as oxygen in general, is also reflected in the fact that it can be ***spontaneously generated*** in microdroplets of water, with smaller droplets resulting in greater degrees of production.[28-29] Nothing is more common than oxygen and hydrogen in biological systems, and it is the chemical combination of these two substances that also accounts for the widespread presence of HP, both inside the body and in nature.

**For all the reasons cited above, HP is the ideal agent for nebulization to treat acute nose and throat infections or to eliminate any CPC that is often present in those areas.**

As should now be apparent from the role that HP already plays in the body in protecting against infection, the nebulization of HP into the sinuses, nasal passages, throat, and lungs is just a straightforward and quite elegant way to ***augment the body's natural expression*** of HP to combat larger pathogen exposures, or even established infections. Individual sensitivities to inhaled peroxide can vary widely, but concentrations of 3% or lower (even as low as 0.1%) will reliably kill pathogens where they encounter the peroxide. When the pathogens have been killed, sensitivity to the inhaled peroxide increases, and it can then become less well-tolerated, as the cells in the mucosal linings can be irritated by the peroxide when it no longer has pathogens upon which to exert its killing/oxidative impact. The only "toxic" effects of inhaled hydrogen peroxide consist of minor degrees of nasal and throat irritation that rapidly resolve upon termination of the HP nebulization.[30]

**The ubiquitous and essential role of HP in the body is further underscored by its vital function as a signaling molecule in both intracellular and extracellular spaces, directly influencing and modulating multiple metabolic processes.**

Additionally, while HP is known to kill all pathogens, it is particularly effective against viruses transported through respiratory routes, which is the case with all cold and influenza-causing viruses, including coronaviruses. In a group of 20 advanced COVID patients in Colombia, South America, the proper application of nebulized HP was able to cure all 20. All patients were experiencing moderate to severe difficulty breathing at the start

of treatment. Many of the patients reported an immediate easing of their shortness of breath with the first nebulization. Because it was in a poor barrio, literally ***no other interventions were applied (or were available)***, and the HP nebulization was able to achieve complete cures in five days as a ***monotherapy***.[31] Similarly, a daily mouth rinse, gargle, and nasal rinse with hydrogen peroxide has been shown to be highly effective in preventing COVID-19 infections, achieving an efficacy rate of nearly 100% when the recommended protocol was followed.[32-33] Other authors had previously suggested that the prophylactic application of HP would have a similar effect in preventing COVID-19 infections.[34-35]

While extensive studies examining the clinical impact of HP nebulization have yet to be conducted, it is already clear that this therapy is effective for many patients, remarkably safe, and exceptionally inexpensive (less than ten cents per HP nebulization). ***There is everything to be gained and nothing to be lost in applying HP in this manner***. It does not need to displace traditional therapies, as it can augment the positive impact of any other clinical intervention. There are no effective therapies that nebulized HP works to counteract or negate in any way.

The unique properties of HP make it an ideal agent for treating infections, especially those acquired through the respiratory route. The inhalation of HP by nebulization is exceptionally effective in rapidly eliminating pathogens from the sinuses, nose, throat, and deep into the lungs. In addition to being highly effective, HP nebulization is also nontoxic, extremely affordable, and readily available to nearly anyone on the planet. Until the COVID-19 pandemic hit the United States and the rest of the world, traditional medicine had primarily offered drugs that alleviated clinical symptoms and general supportive care as the primary treatments for a cold, influenza, or any other respiratory virus. However, the pandemic has spawned an enormous amount of research worldwide, and scientific journals have stepped up, fast-tracking the

publication of quality clinical research from years to just months. There are now multiple treatments that have been documented to rapidly resolve such clinical respiratory syndromes with virtually no clinical failures, and can be considered near-absolute cures for these syndromes when properly administered.

> **HP nebulization stands out as the most impressive therapy for eradicating viruses contracted through respiration.**

The negligible cost of HP will forever prevent it from being accepted by mainstream medicine and its benefactor, the pharmaceutical industry, since it would displace so many money-generating therapies and protocols. There will never be any large prospective, double-blind, placebo-controlled trials of HP nebulization, at least not honest and ethical trials. No industry, especially medicine, seeks to find highly effective treatments that generate little to no profit. Instead, reports on the inappropriate application of highly concentrated HP resulting in severe side effects and death are periodically published.[36-37] Recall that too much water ingested rapidly can also be fatal. Even so, nobody regards water as a potential toxin.

Nevertheless, the itemization of HP properties that make it an ideal agent for eradicating infections and promoting healing is impressive:

- ✓ Documented broad-spectrum antiseptic/disinfectant applied externally
- ✓ Completely nontoxic when properly administered
- ✓ Tiny in size, nonionic, and permeable to all cell, intracellular organelle, and pathogen membranes
- ✓ Present and continually produced everywhere in the body

- ✓ Chemically stable until the proper microenvironment stimulates its pro-oxidant activity (Fenton reaction)
- ✓ Increased production in the face of infection and inflammation
- ✓ Secreted continually by the cells lining the airways, serving as a natural defense mechanism against newly inhaled pathogens
- ✓ Pulmonary infection stimulates increased production of HP into the airways.
- ✓ Naturally present in the urine, minimizing infection presence there
- ✓ After pathogens are killed, HP breaks down into WATER and OXYGEN, forming the perfect microenvironment for damaged tissue to heal.
- ✓ Improves blood oxygenation significantly when inhaled by nebulization

Oral applications of HP have also been reported to be highly effective in relieving and even resolving a wide array of medical conditions. This offers another inexpensive option for many individuals in addition to whatever other protocol that might be followed. The oral administration of HP likely has a similar impact on lessening the leaky gut and abnormal microbiomes that result from the swallowing consequences of CPC in the nose and throat.[38] And when one has an integrative physician familiar with the proper intravenous administration of HP, this form can also be profoundly effective in dealing with overt and occult infections.

## Ozone

No agent exceeds the pro-oxidant, pathogen-killing ability of properly administered ozone. Interestingly, the basic chemical structure of ozone is remarkably similar to that of HP. HP can be regarded as a dioxide of hydrogen, and ozone (O3) can be considered as a dioxide of oxygen. This dioxide-like structure (two bound

oxygens in the molecule) is also present in other molecules with powerful pro-oxidant, pathogen-killing capacity. Chlorine dioxide, nitrogen dioxide, sulfur dioxide, carbon dioxide, titanium dioxide, and silica dioxide have all been shown to have significant anti-pathogen properties.[39-45]

Like HP, ozone has been shown to increase blood oxygen levels and enhance oxygen delivery to tissues, in addition to its anti-pathogen effects. Such an effect can only be expected to enhance the healing of damaged tissues further after the pathogen's presence has been eradicated. Furthermore, tumor cells incubated in an ozonated medium have been shown to accumulate HP, supporting the concept that ozone utilizes HP-related mechanisms in its pro-oxidant response, which is involved in treating cancer cells as well as pathogens.[46] Anything that can increase HP levels in or around a target cell or pathogen greatly facilitates its susceptibility to destruction when the focal microenvironment (acidic, hypoxic) triggers the conversion of HP to hydroxyl radical.

Although VC appears to have been much more applied and studied during the pandemic as an anti-COVID agent, there is no evidence to suggest that ozone is not just as effective in destroying the COVID pathogen as any other pathogen.[47] Furthermore, studies show that ozone is beneficial while maintaining a high safety profile when used as adjuvant therapy in the treatment of advanced COVID patients.[48-51] Applied early enough during a COVID infection, ozone significantly reduces hospitalization time and improves blood oxygenation. Laboratory markers of coagulation and inflammation are also significantly improved with ozone therapy.[52-53]

**Laboratory markers of coagulation and inflammation are also significantly improved with ozone therapy.**

Chronic COVID symptomatology secondary to persistent spike protein (PSP) responds very well to oxygen-ozone autohemotherapy. Fatigue remains the singular most common symptom in such PSP patients, even though many other symptoms can be present as well. In fact, over 50 long-term symptoms from COVID and PSP have been reported.[54] In a series of 100 chronic COVID patients primarily suffering from chronic fatigue, one to nine ozone autohemotherapy treatments were administered over as long as a three-week period. All patients reported reduced fatigue, and impaired functionality secondary to chronic fatigue was restored to a normal level in at least two-thirds of the patients.[55]

Anecdotal evidence, as observed in before-and-after dark-field microscopic examinations on patients with indirect evidence of ongoing PSP presence (increased Rouleaux formation), shows that ozone treatments can quickly resolve this PSP-associated abnormality under the microscope.[56]

Since PSP appears to be the primary, or even sole, culprit in patients suffering from chronic COVID symptomatology, the ability of ozone to resolve such symptomatology implies that any spike protein circulating in the blood, and possibly present elsewhere in the body, can be obliterated by properly administered ozone. Since ozone is known to degrade and inactivate intact viruses, it is logical that it can also degrade "pieces" of a virus, such as the spike protein part of the COVID-19 pathogen.

There are a number of different ways to apply ozone to a patient. For the acute COVID patients, or for the chronic COVID patients with PSP, ozone autohemotherapy or even direct IV injection of ozone gas can be performed. Autohemotherapy involves removing blood, mixing with anticoagulant and ozone gas, and reinjecting back in an intravenous manner. Direct ozone gas injections can be safe and very effective, but many practitioners avoid

this type of application nevertheless, feeling the autohemotherapy is the only really safe way to apply ozone to an infection.

## Ultraviolet Blood Irradiation

Direct ultraviolet (UV) irradiation, without involving blood irradiation, has been well-established for a long time as an ideal method for killing pathogens outside the body.[57-59] The COVID pathogen has also been shown to be easily inactivated by such irradiation.[60]

The awareness of the impact of direct UV irradiation on pathogens led to the investigation of the effect of ultraviolet blood irradiation (UBI) on patients with various infections. UBI proved to be as effective against pathogens inside the body as it was against pathogens outside the body. In a series of 47 early to moderate advanced cases of spinal type polio infection, UBI alone cured all the cases. Dramatic responses have also been documented for the UBI treatment of acute viral hepatitis and advanced sepsis. Even conditions such as arthritis and asthma have shown a positive response to UBI.[61-62]

UBI has also been shown to increase the content of HP inside the phagocytic white blood cells. This aligns well with the concept that all bio-oxidative therapies appear to ultimately utilize the anti-pathogen properties of HP to resolve, or aid in resolving, an infection, either directly or indirectly through the impact of immune cells.[63]

## Hyperbaric Oxygen Therapy

An exceptionally potent therapy for resolving deep-seated and otherwise non-healing infections, Hyperbaric oxygen therapy (HBOT) involves inhaling 100% oxygen inside a pressurized chamber that ranges from 1.5 to 3.0 times normal atmospheric pressure. In addition to increasing blood and tissue oxygen levels, HBOT also appears to utilize the anti-pathogen properties of HP in killing pathogens and resolving infections.[64]

The expense and limited availability of HBOT nationwide are the primary factors limiting its routine use. However, its ability to resolve infection is extraordinary. It should always be remembered that this therapy exists when dealing with life- and/or limb-threatening infections. No patient should ever have an infected limb amputated or otherwise needlessly die before all the bio-oxidative therapies, including HBOT, have been administered.

## Inhalation Medicine

Much of the experience with the inhalation of anti-pathogenic agents to treat upper respiratory tract infections has occurred since the pandemic began in early 2020. Before this time, there was less urgency to knock out what appeared to be an early cold or influenza than when the initial strains of COVID began killing patients relatively easily by settling in the lungs and depriving them of sufficient oxygenation to survive. Because of this, along with the fact that COVID and its new strains have not disappeared, all treatment protocols for all conditions, acute or chronic, should include killing all pathogens accessible in the nasopharyngeal and upper respiratory tract as promptly as possible. Additionally, such treatments should be included even if the patient does not have any nose, throat, or upper respiratory problems, as chronic pathogen colonization (CPC) is widespread and often completely asymptomatic (see Chapter 2).

**Nebulization is a well-established procedure used to deliver a wide variety of therapeutic agents into the lungs to combat infections and/or improve lung function in various medical conditions.**

Eradicating asymptomatic CPC is always beneficial, sometimes enormously, in the treatment and management of any acute or chronic disease or medical condition, as CPC promotes a leaky gut and a toxic microbiome that continually seeds the body with pathogens and pathogen-generated toxins. There

does not have to be any suspicion of chronic infection being a part of the disease being treated to realize this benefit.

The best, and probably the only, way to reliably eliminate CPC in the throat and lungs is to directly attack it with the inhalation of appropriate anti-pathogenic agents. They must also be capable of stripping away the protective biofilms that cover them and prevent prescription antibiotics from reaching them. Whether due to a new COVID strain, a "regular" cold or flu virus, or a new pandemic infectious agent, ***CPC must be promptly eradicated as quickly as possible***. This usually stops the infection completely if it is not already at an advanced stage, but it is always beneficial. It is also highly beneficial when treating any acute or chronic disease in which there is no clinical suspicion of acute or chronic infection.

The optimal agents to be inhaled should be:

- ✓ highly ***effective***,
- ✓ completely ***nontoxic***,
- ✓ readily ***available***, and
- ✓ ***inexpensive***.

Lacking any one of these four aspects of a potential therapy can cripple how well a pandemic can be promptly and readily resolved, as many patients need to take the treatment as soon as possible. As mentioned above, one or more of the inhaled agents should nevertheless be an initial part of a treatment protocol for any condition.

Inhalation Medicine is a growing branch of medicine that provides a wide array of new approaches to disease via the inhalation of therapeutic agents into the lungs. Although the application of agents via inhalation has been around since ancient times, the current and widely available technology of inexpensive and highly efficient nebulization devices is rapidly expanding the application of this form of medicine.

Nebulization is a well-established procedure used to deliver a wide variety of therapeutic agents into the lungs to combat infec-

tions and/or improve lung function in various medical conditions.[65-67] Patients with chronic lung disease and asthma are regularly treated with this procedure. The therapeutic agents are typically dissolved in water or saline solution and converted into a fine mist of such a tiny droplet size that it can reach deeply into the lungs upon inhalation. At the same time, such a nebulized agent is also reaching inside the sinuses, along with all the mucosal surfaces in the nasopharynx and oropharynx. Nebulization therapy is being used effectively to prevent pneumonia in patients supported on mechanical ventilation.[68] It is also being increasingly used as an additional option for delivering different drugs to patients on mechanical ventilation.[69]

Infections that start in the nose and throat, including COVID-19, the common cold, influenza, and any other respiratory viral infection, are ideally addressed by nebulizing agents that inactivate viruses and kill cells already containing a high viral load. While early intervention with an appropriately prescribed and nebulized pathogen-killing agent can serve as an effective monotherapy, it is best to regard all applications of Inhalation Medicine as natural adjuncts to other indicated medical therapies for both respiratory conditions and various chronic diseases. While respiratory infections are most accessible by nebulization, many different conditions in the lungs and the rest of the body can be positively impacted by the nebulization of appropriate agents.

## HP Nebulization Guidelines

Regular off-the-shelf 3% hydrogen peroxide can be utilized. Preparations of greater pharmacological purity (food-grade) can be used if desired. These purer preparations are the best option if the nebulizations are intended to be performed indefinitely for good health maintenance. However, there should be no hesitation in using less pure preparations when food-grade preparations are not available and upper respiratory symptoms are already developing.

For most adults, the 3% concentration can be utilized in the nebulization chamber undiluted. This optimizes the degree and rapidity of the antiviral and anti-pathogen effect. However, there should be no reluctance to dilute the 3% solution if not easily tolerated. Note that the first few partial inhalations might not be well-tolerated. Still, these initial inhalations effectively "coat" the mucous membranes with the HP mist, and subsequent inhalations are not only well-tolerated but also relaxing. However, never continue inhaling any agent that continues to make breathing more difficult, HP or otherwise.

**If performed on a daily or several times weekly basis, a very positive impact on bowel and gut function will also typically be realized, as killing the chronic pathogen colonization present in most noses and throats stops the 24/7 ingestion of these pathogens and their associated toxins.**

When a runny nose or slightly sore throat is already present, 5- to 15-minute nebulization sessions can be undertaken roughly four times daily or until symptomatic relief is realized. Many individuals report significant improvement within minutes after the first treatment. However, it would be advisable to persist in these treatments several times daily for at least 24 to 48 hours after everything feels completely normal in the sinuses, nose, and throat to assure a complete resolution of the infection.

For some, the 3% concentration results in excessive stinging or burning in the nose, as well as soreness in the throat. Such individuals can dilute with saline solution or even just water until they find their highest comfortable concentration. Lower concentrations can be utilized with a beneficial effect, but a positive clinical response is expected to occur more rapidly with higher concentrations.

As it is an entirely nontoxic therapy, HP nebulization can be done as often as desired. If performed on a daily or several times weekly basis, a very positive impact on bowel and gut function will also typically be realized, as killing the chronic pathogen colonization present in most noses and throats stops the 24/7 ingestion of these pathogens and their associated toxins. When done frequently in the clinical absence of infection, only 1 to 2 minutes of slow, deep breathing with the nebulizer should serve as an excellent preventive measure against any new CPC taking hold, as other sources of pathogens (infected gums, teeth, and/or tonsils, or a tongue with CPC) can quickly reseed the throat and upper lungs without ever having had a cold, flu, or other preceding respiratory infection.

If daily prevention is not a practical option, be prepared to nebulize whenever you feel you have been exposed to a significant pathogen, such as when someone sneezes in your face or when you finally disembark from a plane after a long flight. Don't wait for initial symptoms. Just nebulize for a minute or two at your first opportunity. Prevention is always easier than remediation.

## Persistent Spike Protein (PSP) Treatment

PSP syndrome following unresolved COVID infection and/or following one or more COVID inoculations is gradually becoming its own pandemic. The massive morbidity and mortality secondary to this syndrome must be vigorously treated whenever encountered, as it does not appear to be a condition that many people can resolve on their own, even over an extended period.

PSP has become so common that any chronically ill patient should be treated as though PSP is present. And unless the patient completely resolves their clinical illness, it cannot be concluded that there is no ongoing PSP presence. Furthermore, most routine blood tests should be normal, especially D-dimer levels, antinuclear antibody levels, CRP levels, and troponin levels, to better assure the absence of PSP.

Except when an acute infection rapidly and completely resolves after a particular treatment, one or more bio-oxidative therapies should always be included in an optimal treatment protocol. Vitamin C, hydrogen peroxide, ozone, ultraviolet blood irradiation, and Hyperbaric oxygen therapy all can have a profound and rapid positive impact on nearly all infections and chronic diseases. Much of the time, any one of them can normalize the patient. However, combining two or more bio-oxidative therapies, if available, is always a positive therapeutic approach for the patient. For example, if a protocol utilizing the highest doses of vitamin C does not readily resolve the persistent symptoms seen in the PSP syndrome and its associated abnormal laboratory results, there should be no hesitation in adding any of the other bio-oxidative therapies to the protocol. In addition to resolving all persistent and chronic symptoms associated with PSP, troponin and D-dimer levels should always be normal, and the most common inflammation-related blood tests, such as CRP, should be at the minimal levels within the laboratory reference range (low normal).

A good protocol, administered with the oversight of a qualified healthcare practitioner, for the PSP syndrome should include, but not necessarily be limited to:

- ✓ Ozone blood treatments, followed by
- ✓ IV vitamin C (50 to 150 grams daily), or any oral form such as ascorbic acid, in the highest doses possible
- ✓ Hydrocortisone (25 to 50 mg) IV or orally with the first daily administration of vitamin C (see Chapter 11)
- ✓ Ultraviolet blood irradiation
- ✓ Hydrogen peroxide nebulization
- ✓ Methylene blue, 25 to 50 mg two or three times daily (see Chapter 14)
- ✓ Hydroxytyrosol 50 mg daily, utilizing a quality olive leaf extract product, to support the natural synthesis of vitamin C from

glucose in the liver. Also, metadichol®, 5 mg daily, a nano lipid form of policosanol

It is up to the treating practitioner to determine how long the protocol should be administered and/or modified as the patient clinically responds.

Proteolytic enzymes that can break down the spike protein can also be added (bromelain, N-acetyl cysteine, nattokinase)

A protocol like this can be used for ALL conditions, but this one is specifically designed to address the PSP syndrome. However, anything that can completely resolve PSP is a good protocol for tackling any medical problem.

## Chapter 17

*In the sciences, the authority of thousands of opinions is not worth as much as one tiny spark of reason in an individual man.*

Galileo Galilei

# Treating Chronic Pathogen Colonization (CPC)

## Treatment Overview

Toxin-induced excess biomolecule oxidation is the pathology that comprises all disease. All toxin sources must be identified and either eliminated or reduced to the greatest extent possible. For most adults with chronic degenerative diseases, this means thoroughly evaluating the oral cavity for chronic focal infections and pathogen colonizations, and taking all necessary acute and chronic measures to minimize ongoing toxin exposure to the blood, lymph, and gut.

Eliminating chronic pathogen colonization (CPC) requires adherence to a regular protocol that serves to eliminate its presence, reduce the likelihood of recurrence, and prevent it from continuing to provoke disease, especially in the gut, from swallowed pathogens and related toxins.

Choosing a well-trained biological dentist is of utmost importance not only in dealing with acute or chronic dental problems, but also in ensuring that as little infection and toxicity as possible is released into the rest of the body on a relatively continuous basis.

## CPC Pathophysiology and Treatment

In Chapter 1, it was shown that all disease and cellular pathology is due to the unique array and concentration of oxidized biomolecules that result from exposure to the given chemical characteristics of one or more toxins. In Chapter 2, it was demonstrated that the primary source of these disease-provoking toxins originates from the growth, metabolism, and ultimate demise of a wide variety of pathogens. The tremendous disease-causing abilities of oral cavity infections (gums, teeth, tonsils, cavitations) were discussed at length. Additionally, the subject of CPC was discussed, and this chapter will address the treatment of this critical disease-causing factor in greater detail.

The goal in treating and normalizing the abnormal microbiome is simple: stop poisoning it with new toxins and pro-oxidants that are ingested around the clock ("24/7"). Additionally, new toxins from external sources (primarily food and water) must be identified and avoided as completely as possible. And for most people, the swallowing of newly generated toxins from mucosal areas of CPC, usually in the nose and throat, must also be stopped. When these new toxin exposures have been successfully eliminated, the previously toxic gut has an incredible ability to heal itself and return to a normal state rapidly, provided enough time is allowed. This can include the resolution of even chronic gut conditions like Crohn's disease and chronic ulcerative colitis, diseases that are still regarded as being incurable.

For most people, CPC assures a continuous ingestion of pathogens, toxic metabolic byproducts, and free reactive iron as the pathogens die and rupture. And if "enriched" foods are a routine part of the diet, more iron, often in the form of metallic iron filings, will be chronically ingested as well. As with all other tissues in the body, toxins or pro-oxidants cause all diseases by oxidizing unique arrays of biomolecules. The more toxins someone ingests, the more pathogen-ridden their microbiome will become. And the leakier their gut will be.

**The goal in treating and normalizing the abnormal microbiome is simple: stop poisoning it with new toxins and pro-oxidants that are ingested around the clock ("24/7").**

More specifically, the swallowed CPC toxins inflict oxidative damage to the intestinal cell walls as they are encountered. When this occurs chronically, the barrier function of these intestinal cells becomes compromised, resulting in a condition known as "leaky gut."[1-2]

Of all cells in the body, intestinal epithelial cells have one of the highest rates of turnover. The intestinal stem cells are so active that each epithelial cell is regenerated anew every 3 to 5 days. This also means that when "old" intestinal cells are regenerated, the contribution of those old cells to a leaking gut ceases.[3-5] Instead, the new gut cells begin their existence providing a new, normal intestinal barrier function that protects against the assimilation of incompletely digested food products into the draining intestinal lymph and blood, which can occur when the barrier cells have been extensively damaged. And if all the damaged intestinal cells are relieved of their constant exposure to toxins and allowed to regenerate,

a completely normal gut can be restored, even if it had been diseased for years.

This begs the question: Is the leaky gut syndrome a "chronic" disease, or is it the ***chronic*** presence of a continuous supply of ***new*** toxin exposures? It would appear to be the latter. The evidence continues to emerge that when you stop poisoning (oxidizing) the gut cells with the toxic products of CPC and iron-added foods, even a long-standing leaky gut, or any other chronic gut disease (often still labeled as being "incurable"), can completely heal, and often quite quickly. Depending on the chronicity of the gut condition, relief from the swallowed products of CPC may only be needed for a few days or up to a couple of months to realize the full benefits of decreased toxin ingestion.

Many foods known to cause allergies and provoke immune system reactions, such as gluten and peanuts, are proteins or have a significant protein content. If they are contained in the gut until the enzymes break them down completely into their constituent amino acids before absorption in the intestine, they provide nutrition only. They are not ***intrinsically*** toxic when completely broken down before intestinal assimilation. However, the immune system will reliably mount a response to incompletely processed proteins and other foodstuffs that are prematurely assimilated into the blood and lymphatic drainage of the intestines. And when this chronic exposure to incompletely digested foods never stops, the resulting autoimmune reaction to them becomes a chronic disease.

Once present, CPC ***generally persists indefinitely*** due to the tenacious nature of biofilms. It often occurs as residual areas of pathogen growth following the resolution of a cold or a bout of the flu. And even though it may seem that the cold or flu has completely resolved, areas of CPC can routinely

remain, and they may persist for life unless and until definitive measures to eradicate them have been applied. Furthermore, once resolved, they are still easily reacquired without necessarily having another cold or clinical infection. Subclinical pathogen exposures to individuals with relatively good immune function can still result in CPC without an overt cold or case of the flu.

**Once present, CPC *generally persists indefinitely* due to the tenacious nature of biofilms.**

CPC is also a significant contributing factor in determining how readily an individual acquires a new clinical infection, including COVID. Effectively eliminating CPC is a substantial factor in determining how quickly and completely someone can develop and/or recover from COVID or any other upper respiratory tract infection.

While CPC has now been documented to be present in the tissues involved in many chronic diseases, its most prominent sites of overgrowth in the body are on the mucosal and epithelial linings of the middle ear, the sinuses, the oral cavity, the throat, the lungs, the tonsils and associated lymphoid tissues, the tongue, and even the esophagus. Traditional medicine adheres to the notion that taking one or more antibiotics is the only effective way to address any infection or pathogen colonization. This is NOT generally true, and it is even less applicable to CPC, which always has biofilm coatings that prevent antibiotics from reaching the underlying pathogens.[6-8] There are currently no known antibiotics that can resolve biofilms. Symptoms associated with a worsening microbiome are often ***precipitated*** by courses of antibiotic therapy while leaving the biofilm-coated area of CPC unaffected and continuing to aggravate the gut with ingested pathogens and their related toxins.

## Probiotics

Probiotics are very popular supplements, and for some individuals, they can lessen the symptoms associated with an abnormal, pathogen-ridden microbiome. However, multiple probiotic formulations are available today, and many of them have either no positive impact or even a negative impact on different individuals. Generally, establishing an effective probiotic therapy depends on a trial-and-error approach. No two gastrointestinal tracts affected by the products of CPC are identical in terms of diversity and concentrations of the pathogens present.

As a general consideration, a probiotic with high concentrations of various strains of *Lactobacillus* and *Bifidobacteria* may be worth trying for some individuals. If such a measure is part of a treatment protocol for an abnormal microbiome, it is probably best if it also has a prebiotic blend of nutrients that is touted to promote the growth of new beneficial microbes. However, probiotics, with or without prebiotics, are designed only to lessen the impact of an abnormal microbiome. They ***do not*** address why it became abnormal in the first place.[9] There is generally no harm in taking any combination of these agents if it affords some symptom relief. However, it must be remembered that these supplements do not address or correct the underlying causes of the abnormal gut condition.

## Tongue Hygiene

The most critical factor in normalizing a gut with established CPC exposure is to minimize the "seeding" of new pathogens into the gut on a continuous, 24/7 basis. Such seeding subjects the gut to not only pathogen-generated toxins from pathogen metabolism and their eventual death or necrosis, but also a constant supply of living pathogens to help sustain or further negatively impact the composition of the abnormal microbiome. A large portion of

this seeding comes from the mouth. An especially important and very commonly neglected reservoir of such pathogens is found on chronically colonized and overgrown tongues.[10] Very few individuals with CPC anywhere else in their alimentary tract have a normal tongue flora or coating.

**Symptoms associated with a worsening microbiome are often *precipitated* by courses of antibiotic therapy while leaving the biofilm-coated area of CPC unaffected and continuing to aggravate the gut with ingested pathogens and their related toxins.**

Many tongues have a heavy biofilm containing an array of bacteria, viruses, fungi, and even protozoa. Additionally, these microbes reside in a primarily anaerobic (oxygen-lacking) environment, facilitated by the overlying biofilm, which further contributes to their potential pathogenicity. Chronically impacted and rotting food particles are the rule in the many fissures and microscopic papillae (tiny finger-like projections on the surface of the tongue) trapped under this biofilm. Your tongue has no way of naturally ridding itself of this noxious overgrowth. Just as your hands or any other part of your body cannot spontaneously clean themselves, neither can your tongue.

Patients with thicker tongue coatings have been shown to have significantly higher serum CRP (C-reactive protein) levels than those with thinner tongue coatings, which, in itself, is indicative of the bodywide increased oxidative stress that this condition can cause and support.[11] Of note, the mechanical removal of the tongue biofilm, especially when done with tongue scraping, is nearly always necessary to treat refractory halitosis effectively.[12-13] Pathogen metabolism generally produces bad smells, while the metabolism of normal flora does not.[14] It has also been shown that

the pathogens commonly seen with periodontal disease are closely related to the foul-smelling tongue coatings.[15]

Because of this, the overgrown tongue plays a leading role in the ***sequence*** of CPC sources that must be eliminated to achieve an optimally healthy gut. Each source should be addressed individually. The protocol for restoring and maintaining a healthy tongue should include the following:

- ✓ Use any commercially available tongue scraper to mechanically remove biofilm, pathogens, and debris related to pathogens. This only takes seconds. Many YouTube videos demonstrate this simple technique. This should be performed at least once daily (most importantly, the last thing at night before retiring, but it is also beneficial to do it both in the morning and at night). Ideally, it should be done after every meal, as each meal can allow new food particles to reseed into the microscopic crevices of the tongue. The rate of redevelopment of tongue coatings is quite rapid, and a minimum of once-daily cleaning is indicated to maintain good control of any newly developing CPC.[16]
- ✓ Whenever you brush your teeth, it is always best to do it after you scrape your tongue. Following brushing, a brief routine of brushing the tongue with a toothbrush and a small amount of toothpaste is also a good idea.
- ✓ Swish and gargle with a 1% to 3% hydrogen peroxide solution after every scraping. A good antiseptic mouthwash can also be used, but incorporating some hydrogen peroxide is optimal. Additionally, it can be added to the mouthwash for a better taste if desired.
- ✓ Consider oral tooth and gum irrigation (as with a Waterpic™) with a bit of hydrogen peroxide (20 to 30 ml of a 3% solution added to 150 to 200 cc of water) added to the water chamber regularly, and always at least daily before retiring at night to eliminate any retained food particulates that would otherwise have the entire sleep period to rot and

putrefy. This rotting is a major factor leading to chronic, deep gum infections (periodontitis), which maintain a population of pathogens in the mouth that is always ready to re-colonize the tongue and other areas of the oral cavity and surrounding mucous membranes.

**To date, there is still no consistently effective way to destroy a persistent biofilm and kill the protected pathogens with *prescribed* medicines.**

## Nebulization

Nebulization is a process that converts a liquid solution of a drug, nutrient, or other therapeutic agent into a fine mist that can be readily inhaled, facilitating direct contact of the nebulized agent with the mucosal linings of the sinuses, oral cavity, throat, and respiratory tract, and to a lesser extent, the middle ear.[17] The multiple benefits of nebulization include the following:

- ✓ A direct route of drug administration, such as for asthma and bronchoconstriction
- ✓ Moistening of inhaled air, promoting the mobilization and expulsion of tenacious mucus or other secretions
- ✓ The direct contact of agents that can strip away biofilms and kill the underlying pathogens in areas with CPC
- ✓ The use of anti-pathogenic agents in lower doses than what is needed for systemic administration, with lessened risk of medication toxicity or other side effects

To date, there is still no consistently effective way to destroy a persistent biofilm and kill the protected pathogens with ***prescribed*** medicines. This is a primary reason why so many individuals have largely treatment-resistant chronic sinusitis, chronic cough, and

chronic mucus production with various degrees of impaired ability to breathe freely, especially when trying to sleep well at night.

Two substances that are especially effective in stripping away biofilms are hydrogen peroxide and dimethyl sulfoxide (DMSO).[18-21] When dealing with chronic conditions in the sinuses and pharynx, it is a good idea to first nebulize with hydrogen peroxide (up to 3% concentration or diluted down to an easily tolerated concentration with saline or water) for 10 to 15 minutes and then follow as desired with nebulization of any of several other agents. With the biofilm eliminated or significantly disrupted, the different agents can function more efficiently. However, the nebulization of hydrogen peroxide alone without other agents will usually suffice to eliminate both the biofilms and the underlying pathogens.

**Two substances that are especially effective in stripping away biofilms are hydrogen peroxide and dimethyl sulfoxide (DMSO).**

Alternatively, DMSO can be readily combined with other antipathogen agents, such as sodium ascorbate (vitamin C) and magnesium chloride. Anecdotally, this DMSO-vitamin C-magnesium chloride combination appears to be very effective in clearing biofilms and their underlying pathogen colonies. This can be done with 1 to 3 cc of 99.9% DMSO brought up to a 10 to 12 cc volume with a combination solution of vitamin C and magnesium chloride. ***Precise concentrations are not critical***, and the combination solution can be quickly and easily prepared by adding approximately two teaspoons of sodium ascorbate powder and two teaspoons of magnesium chloride powder to about half a cup of water.

Remember that nebulization, along with regular tongue and oral hygiene measures, each positively impacts the gut microbiome and any readily accessible areas of CPC separately. Nevertheless,

the combination of all these interventions can be expected to have a synergistic impact, rather than just an additive one, in establishing and maintaining a normal or near-normal gut microbiome, while also promoting a more normal nose and throat flora. And a normal gut microbiome will also prove to be very synergistic in optimizing the beneficial effects of ***any*** clinical treatment protocol for any medical condition, since there is no longer a leaky gut permitting easy access of pathogens and their toxins to the rest of the body.

Notably, numerous agents have been nebulized with a positive health impact. Nebulized hydroxychloroquine is well-tolerated and a contributory treatment for COVID pneumonia.[22] Other nebulized agents include coenzyme Q10, vitamin D, vitamin A, vitamin E, ascorbic acid, and citric acid.[23-29]

## Common Oral CPC infections

Although seldom recognized by the traditional dental industry or the medical world, the human mouth is the breeding ground for most of the CPCs that wreak havoc throughout the body. Four of the most common pathogen accumulations are located in the oral cavity, and they are generally asymptomatic. They are:

1. Chronic Apical Periodontitis (CAP)
2. Root canal-treated teeth
3. Cavitational osteonecrosis
4. Chronically infected tonsils

All four of these conditions are discussed in much greater detail in Chapter 2. For certain conditions, particularly diseases of the heart and coronary arteries, as well as cancers (especially breast cancer), oral pathogens are nearly always the disease-causing culprit. It is more than reasonable to assume that an oral CPC or pathogen abscess is the silent reason for these diseases.

In the case of the first three items on the list above, the expertise of a biological dentist is required, both for diagnosis

using cone-beam computed tomography (CBCT) examinations of the teeth and oral cavity, and for remediation if an infection is discovered.

Chronic tonsillar infections are often asymptomatic and inapparent even upon visual examination. A high serum C-reactive protein (CRP) reading can be a reliable indicator of the presence of a CPC, and after treatment, a normal reading can indicate a successful resolution. There are at least four relatively non-invasive ways to improve and even resolve chronic tonsillar infections. These should all be used together if possible:

- ✓ Ozone gas injections are made directly into the tonsils. One protocol utilizes a 30-gauge needle, 1.5 inches long, with injections of up to 2.5 cc of ozone gas, at a concentration of 10 to 50 gamma.
- ✓ Periodic ozone gas ear insufflation treatments.
- ✓ Hydrogen peroxide nebulization.
- ✓ Application of 1% pharmaceutical grade (USP) methylene blue (MB) directly to each tonsillar surface, with a few drops administered daily for several weeks.

Just remember, when a CPC is involved in a patient's disease, a long-term resolution will not usually be attainable without first eliminating the seeding infection.

## Personal Experience

Except when specific scientific research is referenced, the reader should be aware that much of what is discussed above has evolved from the author's personal experience in treating his medical conditions. Following some of the recommendations above, a chronic sinusitis, along with a persistent and dry cough of nearly 60 years' duration, was largely resolved. Resolving CPC also completely normalized bowel function for the first time.

## Choice of Dentist

With all the information presented above, as well as in Chapters 6, 7, 18, and 20, it should become apparent that arguably the most critical health decision to make is selecting the right dentist for your needs and those of your family. Choosing a mainstream dentist who has not attempted to learn the biological science of dentistry and only follows the mechanical aspects of dentistry can be a health-robbing and even fatal decision for an individual. Even now, the amount of documented scientific documentation on the toxicity and adverse health consequences of root canals, periodontitis, occult tonsillar infection, toxic dental materials such as mercury, cavitations, and chronic pathogen colonization continues to escape, or be entirely ignored by, and often ***even ridiculed by***, traditional dental practitioners.

**Heart attacks and breast cancers collectively account for a majority of adult deaths in developed countries around the world, and these two conditions alone are nearly completely avoidable and also largely reversible when the principles of biological dentistry are routinely applied in those affected individuals.**

Heart attacks and breast cancers collectively account for a majority of adult deaths in developed countries around the world, and these two conditions alone are nearly completely avoidable and also largely reversible when the principles of biological dentistry are routinely applied in those affected individuals. Of course, virtually all other chronic degenerative diseases are strongly fueled by dental pathogens and their related toxins as well. The following can be asserted:

**For many, the worst thing for achieving good health is choosing a traditional dentist; however, the best decision for long-term health is to select a highly trained biological dentist.**

The chosen dentist should also provide a comprehensive informed consent for any dental procedure, especially a root canal. A handful of biological dentists "offer" root canals as well, even though they do not necessarily feel it is the best option for the patient. Such informed consent needs to capture the conclusions of the scientific literature cited in this chapter, as well as those in Chapter 2. Not all root canals cause a patient to become sick, although it is impossible to predict ahead of time when a root canal will cause problems. As such, the option to have a root canal should not be taken away from the patient. A patient may not want to consider an extraction that is perhaps followed by an implant, bridge, or plate/denture. It is essential, however, that the informed consent utilized does not become a fact-poor and clever rationalization for the dentist to proceed with the root canal. The patient must always be completely informed of the scientific truth about a procedure.

## Traditional versus Biological Dentistry

While "traditional" dentistry has harmed (and even killed) countless patients, the practice of reasoned and sophisticated biological dentistry improves the overall health of its patients more than any other health-oriented profession. Essential differences between traditional and biological dentistry include the following:[30]

- ✓ Biological dentistry strives to avoid the use of toxic materials whenever possible. Traditional dentistry is only concerned with the mechanical quality of the materials it uses. For example,

biological dentists not only avoid using mercury in fillings, but they also follow necessary protocols to minimize toxic mercury exposure when the fillings are removed. Tremendous and permanent harm often occurs when a traditional dentist drills out mercury amalgam fillings without regard for protecting the body from the acutely inhaled mercury vapor and swallowed mercury that results from inappropriate removal techniques. It is arguably better for the patient to leave amalgams in the mouth rather than have them removed without a proper protocol in place.

- ✓ Biological dentistry strives to identify and remove all infected and abscessed teeth, as is seen with all root canals and any other asymptomatic abscessed teeth (chronic apical periodontitis or CAP). This requires the routine administration of cone-beam computed tomography (CBCT) in the initial evaluation of all dental patients. Tooth extraction protocols must include a proper cleaning of the infected tooth socket following complete removal of the periodontal ligament.
- ✓ The proper use of ozone in killing residual pathogens and accelerating quality healing in a tooth socket post-extraction; also, the appropriate use of platelet-free plasma to further assure good healing; small (2 to 3 unit) injections of long-acting insulin in or near the socket post extraction can also enhance the quality and speed of healing greatly.
- ✓ The recognition and appropriate diagnosis and remediation of cavitations at old tooth extraction sites, along with the need to

look for cavitations with a drill bit at old extraction sites of the larger teeth.

- ✓ The proper treatment of tonsils that have spent any amount of time draining a mouth with infected teeth and/or gums.
- ✓ Utilization of regular water irrigation with an anti-pathogen, such as hydrogen peroxide, for gum care and gum treatment
- ✓ Properly addressing chronic pathogen colonization in the oral cavity, nose, and throat.
- ✓ The proper use of natural healing agents such as vitamin C, magnesium, and insulin for the elimination of residual infection and optimal healing.

## Chapter 18

*Whenever you find yourself on the side of the majority, it is time to pause and reflect.*

Mark Twain

# Treating Cardiomyopathy and Coronary Heart Disease

## Cardiomyopathy Treatment Overview

ATP, the primary energy-producing molecule in the body, is depleted in all forms of cardiomyopathy. The severity of the depletion is directly proportional to the severity of the disease. Since heavy metal accumulations are frequently responsible for ATP depletion, the treatment protocol will need to include chelation and toxin mobilization therapy. For more background and rationale for the suggested protocols, see Chapter 5.

Another issue requires the clinician to determine whether chronic COVID-19, characterized by persistent inflammation mediated by the spike protein, is involved in the underlying pathology. When this is the case or is even suspected, eradication methods should be aggressively incorporated.

Only after the presence of heavy metals and infectious causes has been ruled out should a diagnosis of idiopathic cardiomyopathy be made. Otherwise, a therapeutic protocol of prophylactic nutrient chelation should be pursued. Specific prescription chelation is needed when it is clear there has been significant heavy metal accumulation, especially mercury, in the heart.

## Cardiomyopathy Treatment Protocols

The proper treatment of any form of cardiomyopathy, but especially advanced congestive heart failure due to an enlarged and poorly contracting heart, needs to be directed primarily at:

1. Toxin elimination
2. Restoring normal cellular energy production

### Toxin Elimination:

A thorough diagnostic work-up is always optimal, although currently unlikely to occur as endomyocardial biopsy is rarely done, except to monitor for microscopic evidence of organ rejection following a heart transplant. And when it is performed, the measurement of heavy metal content is never a routine part of the examination. A provoked urine challenge test with an established chelation agent, such as EDTA (ethylenediaminetetraacetic acid), DMSA (dimercaptosuccinic acid), or DMPS (dimercaptopropanesulfonate), can be expected to result in a significant release of multiple heavy metals, and it should be routinely part of a cardiac failure workup.[1]

Mercury is detected in most people, although it is often given little regard because no "obvious" mercury exposures are evident. However, the number of people exposed to mercury amalgam dental fillings for many years is enormous, and the astronomical levels of mercury found in many idiopathic dilated cardiomyopathy (IDCM) patients are primarily a result of these fillings.[2-5]

Furthermore, a brisk release of mercury on urine chelation challenge should never be disregarded as inconsequential.

Hair analysis can also be instrumental in evaluating the body's heavy metal content and should be done in conjunction with a provoked urine challenge. For example, autistic children had significantly higher levels of mercury, lead, arsenic, antimony, and cadmium compared to controls.[6] In another study, DMSA was shown to be effective in increasing mercury and antimony excretion in children with autism spectrum disorders.[7]

> **While heavy metal chelation is still not routinely done, it should logically become part of the standard-of-care treatment protocols for most medical conditions and diseases, even in the absence of testing for heavy metal accumulation.**

Antimony warrants additional attention, as its levels within IDCM hearts were also strikingly elevated. Generally given little attention, antimony is ***as toxic, or even more toxic, than arsenic***.[8] Finding IDCM heart muscle with 22,000 times the normal level of mercury and 12,000 times the normal levels of antimony must not be disregarded as a stunning curiosity. Instead, it ***must be regarded as the primary reason for the decreased heart function, and treatment should be administered with that in mind***. Significant antimony exposure is difficult to avoid, as levels in the air and water continue to increase due to multiple sources. In particular, there is a substantial leaching of antimony from plastic containers.[9-12] Water in plastic bottles is ingested regularly by many people.

> **Until definitively established otherwise, an enlarged and poorly contracting heart (advanced congestive cardiomyopathy) must be assumed to be substantially secondary to heavy metal accumulation, especially mercury and antimony.**

As discussed above, the evidence indicates that cardiomyopathies can be assumed to have significant heavy metal accumulation and ongoing low-grade chronic inflammation. Additionally, the presence of persistent spike protein is expected to become increasingly prevalent and clinically significant in the ongoing COVID-19 pandemic.

Regardless of any test results, all patients with cardiomyopathy should be taking one or more chelating agents, which mobilize toxins for elimination. Furthermore, follow-up blood, urine, and/or hair testing should be conducted to confirm that toxins are being mobilized as a result of the chelation therapy. When testing indicates high levels of one or more heavy metals, potent prescription chelation administration is often advisable, especially when heart failure or another chronic disease is advanced. Such agents include, but are not limited to, the following:[13]

- ✓ NBMI (N,N'bis-(2-mercaptoethyl) isophthalamide), orally, is especially effective for mercury
- ✓ EDTA (orally, intravenously; calcium disodium EDTA is the best choice)
- ✓ DMSA (orally; especially effective for mercury and antimony)[14-15]
- ✓ DMPS (intravenously—very potent, can cause substantial detox symptoms)
- ✓ Dimercaprol (British anti-Lewisite [BAL])[16]
- ✓ Penicillamine
- ✓ Deferoxamine
- ✓ Trientine (especially copper)

NBMI is a chelation agent that is not yet approved by the FDA. However, it has been shown to be enormously effective in tightly binding mercury and completely blocking its toxicity, while permitting its eventual excretion from the body in the stool. Discovered and developed by Dr. Boyd Haley of the University of Kentucky, NBMI is lipophilic (fat-soluble) and enters cells very easily. In

addition to mercury binding, NBMI also strongly binds lead and cadmium while not depleting essential metal ions and important electrolytes in the body, including calcium, chloride, magnesium, potassium, sodium, and zinc.[17]

**Regardless of any test results, all patients with cardiomyopathy should be taking one or more chelating agents, which mobilize toxins for elimination.**

Furthermore, unlike many other prescription chelators, NBMI immediately renders the mercury it binds to a completely nontoxic state, and there is no significant release of the mercury from the chelation complex once the initial binding takes place. Detoxification never results in retoxification, such as can occur with DMPS and DMSA. Optimal chelation does not result in a detectable degree of excretion toxicity. In a randomized controlled trial, NBMI was very effective in reducing tremor while increasing energy in gold miners with elevated urine mercury levels after only 14 days of oral administration.[18-19]

NBMI has been demonstrated to be virtually nontoxic, and it is efficiently excreted in a nontoxic form. It also has an extraordinarily potent antioxidant impact, which is always a desirable effect when treating patients dealing with increased levels of oxidative stress inside the cells.

Important nutrient chelators or toxin mobilizers:

- ✓ Organic acids, including alpha lipoic acid, citric acid, and ascorbic acid[20-23]
- ✓ NAC (N-acetylcysteine)
- ✓ Glycine
- ✓ IP6 (inositol hexaphosphate)
- ✓ Carnitine[24]
- ✓ As much of a wide variety of antioxidants as is feasible, including bioflavonoids, amino acids, and any supplement or food with a ***high***

***organosulfur content***, such as MSM.[25] Many chelators, including the prescription agents, are synthetic amino acid derivatives.[26]

One of the best health care investments is a quality far-infrared sauna. Over a sufficiently long period, virtually all stored toxins are mobilized and excreted through the induced sweats. Caution is required in sicker patients, as the sauna must be well-tolerated without any risk of passing out and allowing body temperature to become disastrously high. Heart failure patients, in particular, would have to be monitored well by a partner who could make sure no problems are developing during the sauna sessions. Notably, additional attention should be given to magnesium and potassium supplementation, as both are readily excreted through sweat.

## Restoring Cellular Energy Production:

All cardiomyopathies have deficient to severely deficient mitochondrial production of ATP. While a broad spectrum of quality supplements is always beneficial for any disease or medical condition, specific supplementation with a sufficient dosage is necessary to optimize ATP production in the heart cells. A suggested regimen for supplementation to help achieve this goal is provided below. Doses are not fixed but can vary significantly from one patient to the next:

- ✓ Vitamin C as ascorbic acid or sodium ascorbate, three to nine grams daily
- ✓ Magnesium, any of multiple forms, one to three grams daily
- ✓ Vitamin D3, 3 to 10,000 units daily, with a blood level target of 50 to 100 ng/cc
- ✓ Vitamin K2, 500 micrograms daily

These four supplements are essential baseline supplements, as they work together to lower intracellular calcium levels, mobilize

and dissolve abnormal calcifications, decrease oxidative stress in all cells, and reduce all-cause mortality.[27-32]

Supplements to stimulate and support mitochondrial ATP production:

- ✓ Niacinamide, one to three grams daily (or NAD supplementation)
- ✓ Riboflavin, 400 mg daily
- ✓ Coenzyme Q10 (ubiquinone or ubiquinol), 300 to 1000 mg daily
- ✓ Methylene blue, 10 to 25 mg daily

The supplements comprise a "Super 8" regimen that serves as an excellent baseline protocol for any condition, but is particularly beneficial for all patients with cardiomyopathy. As ATP is essential in all cells of the body, this supplement combination can also yield significant clinical benefits in various other medical conditions, as every cell in the body is positively impacted. The following nutrient supplements also support mitochondrial ATP production and can be added to the overall chelation/supplementation protocol as desired:

- ✓ Olive leaf extract to supply 50 mg hydroxytyrosol daily to boost endogenous vitamin C levels; also 5 mg daily of metadichol®, a nano lipid form of policosanol.
- ✓ Tyrosine (a CoQ10 precursor)
- ✓ Selenium (often depleted in cardiomyopathy)
- ✓ Succinate[33]
- ✓ 5-aminolevulinic acid (supports cytochrome c oxidase function)[34]
- ✓ Glycine (helps produce 5-aminolevulinic acid)[35]
- ✓ Ribose (rate-limiting precursor for adenine nucleotide synthesis and ATP production)[36]
- ✓ Carnitine (increases ATP; its deficiency also induces cardiomyopathy)[37-38]

All dosing of prescription and supplemental agents should be under the guidance of the healthcare practitioner managing the

patient's care. The above agents are intended to be a ***general guide only***. Clinical response and serial changes in laboratory testing are the primary methods for determining how well a patient is responding to a given treatment protocol.

## Coronary Artery Disease Treatment Overview

Chronic pathogen colonization (CPC) is implicated in the development of most, if not all, chronic degenerative diseases (see Chapter 2). This is undoubtedly true in the case of coronary artery disease.

CPC is always found in the coronary arteries of those who have atherosclerotic plaques, and this constant infectious exposure keeps the artery in a chronic focal state of scurvy with little or no vitamin C present. As long as the state of focal scurvy exists, these plaques will continue to grow and eventually entirely block the artery, resulting in a heart attack. Refer to Chapter 6 for more background and rationale for the recommended protocols for coronary artery disease.

Oral focal infections, often abscessed teeth, which seed the coronary arteries, must be identified and eliminated to maintain a satisfactory resolution of the condition. Cone beam computed tomography (CBCT) is the most effective method for locating these oral infections. Additionally, optimal supplementation and hormone levels will be necessary to stabilize or reverse the buildup of arterial plaque.

### Resolving Coronary Atherosclerosis

Stabilizing or reversing coronary atherosclerosis requires optimizing the healing response in the affected areas of the arteries. Like any other non-healing wound, atherosclerosis requires a normalized redox (reduction-oxidation) balance to facilitate

healing. The presence of any pathogen is a potent and continuous source of new pro-oxidants (toxins), which then provokes a chronic inflammatory process. As described above, this means that sufficient levels of vitamin C in the arterial wall can never be realized when the new pathogen-related toxins are not eliminated or at least severely curtailed. And until those vitamin C levels can be restored, a chronic inflammatory response with an influx of fibroblasts building up the plaque will continue unabated.

The goal of any effective treatment for the stabilization and/or resolution of coronary atherosclerosis is simple, although not necessarily easily achieved. The presence of new toxins (new oxidative stress) must be prevented, and existing oxidative damage must be repaired. Improving the redox status in the artery alone does not complete the task until the new toxins (infections) are also stopped.

**As Dr. Hal Huggins, the father of biological dentistry, so elegantly expressed it: "You can't dry off while you are still in the shower."**

**While focal infections located anywhere in the body can potentially seed the coronary arteries and other sites remote from those infections, the simple fact is that oral cavity infections are responsible for pathogen seeding (CPC) in atherosclerotic coronary arteries in well over 90% of cases.**

While focal infections located anywhere in the body can potentially seed the coronary arteries and other sites remote from those infections, the simple fact is that oral cavity infections are responsible for pathogen seeding (CPC) in atherosclerotic coronary arteries in well over 90% of cases. Focal infections outside of the mouth do not have the direct connection to the venous and lymphatic drainage that infected gums, teeth, and tonsils have. Additionally, other sites of infection do not generate the high pressures that occur when teeth grind

and chew. These pressures significantly increase the expression of pathogens and their toxins into the bloodstream and lymphatic system.

**...higher [blood] pressures drive the pathogens into the coronary arterial wall, initiating the CPC that depletes vitamin C and eventually triggers the inflammatory process leading to atherosclerosis.**

The nature of blood circulation is also crucial in determining where most oral pathogens are seeded elsewhere in the body. Blood pressure is the primary factor. When pathogens are circulating in the low-pressure venous side of the circulation, seeding does not occur. However, as soon as the venous blood eventually returns to the heart and the left ventricle, the pressure immediately goes from 5 to 10 mm Hg to whatever systolic pressures are found in the patient (100 to 200 mm Hg) as the blood exits the heart. Due to their origin in the root, or beginning, of the aorta, the coronary arteries are subjected to the maximal pressures that can be inflicted in the circulation.[39] These higher pressures drive the pathogens into the coronary arterial wall, initiating the CPC that depletes vitamin C and eventually triggers the inflammatory process leading to atherosclerosis. This is a primary reason why uncontrolled hypertension is considered a significant risk factor for developing atherosclerosis.

The diagnosis and elimination of infectious foci in the mouth are rarely part of the routine treatment for patients with suspected or established coronary heart disease. Nevertheless, it remains the most critical part of an atherosclerosis treatment or prevention protocol. Optimal supplementation while leaving such infections unaddressed will not protect the patient as effectively as removing all infective foci ***without*** optimal supplementation. However, doing both will reliably

halt atherosclerosis progression and often result in its regression and even disappearance.

Essential to achieving complete resolution of oral cavity infections is the administration of a cone-beam computed tomography (CBCT) examination of the oral cavity. Also known as a 3D X-ray of the mouth, grossly abscessed but completely symptom-free teeth are OFTEN found, and just one of them can initiate coronary atherosclerosis and persist until it is properly removed.[40] Infected gums, tonsils, sinuses, and cavitations are often present as well.

In addition to finding and treating oral cavity infections, it is vital to normalize critical hormone levels, including sex hormones, cortisol, and especially thyroid hormone. All hormones work to minimize oxidative stress throughout the body. When oxidative stress is sufficiently elevated, focal infections can effectively metastasize and establish themselves anywhere in the body, particularly in the coronary arteries.

Maintaining completely normal levels of thyroid hormone in the body's cells, along with normal sex hormone and cortisol levels, can ***help keep focal infections localized***. The work of Dr. Broda Barnes demonstrated the powerful ability of a completely normal thyroid hormone status in preventing heart attacks, which meant that oral focal infections were not resulting in a CPC of the coronary arteries.[38] While any degree of ***hyper***thyroidism and advanced ***hypo-***thyroidism are easily detected and can be appropriately addressed, many people have a low-grade subclinical hypothyroidism that is not detectable by traditional thyroid testing. As this mild hypothyroidism is prevalent and a "baseline" problem for many adults, it typically remains undiagnosed and unaddressed by most clinicians.

While following Dr. Barnes' clinical approach allowed for the diagnosis of subclinical hypothyroidism, evidence now indicates that maintaining normal thyroid function in all cells of the body requires maintaining an optimal ***free T3/reverse T3 ratio***. Generally, a target value of 18/1 to 20/1 is recommended, but higher ratios are also

perfectly acceptable. Just measuring the "standard" thyroid blood tests will not detect the mild but significant compromise of thyroid function that allows focal infections to spread. Here is one example of how to calculate this ratio:

**Free T3 (triiodothyronine) 3.1 pg/mL (ref. range: 2.0-4.4)**
**Reverse T3 18.4 ng/dL (ref. range: 9.2-24.1)**
**To convert pg/mL to ng/dL:**
**multiply by 100-3.1 x 100 = 310**
**Then divide the two numbers: 310/18.4 = 16.85**

Some websites allow for easy conversion. One is https://www.optimaldx.com/calculators/free-t3-reverse-t3-ratio-calculator

Generally, higher reverse T3 levels indicate a greater contribution of unchecked oxidative stress in the body, and lower T3 levels indicate a greater contribution of decreased thyroid hormone to that increased oxidative stress. However, most individuals with a low ratio, as seen here, have a combination of increased oxidative stress and decreased thyroid hormone levels. Long-term follow-up is essential to determine the continued need and dosage of desiccated thyroid (NOT Synthroid or T4) after focal infections are resolved, as it is never clear how reversible a low thyroid hormone level is in each individual. All oral cavity infections have direct lymphatic drainage and venous blood drainage into the thyroid gland, which is situated directly below the mouth.

The protocols of dental revision, supplementation, and appropriate hormone application are covered in depth elsewhere.[41]

## Chapter 19

*The trouble with the world is not that people know too little;*
*it's that they know so many things that just aren't so.*
Mark Twain

# Optimal Cancer Treatment

## Treatment Overview

Cancer is a disease, usually chronic, characterized by the highest levels of increased intracellular oxidative stress compared to all other conditions. While all diseases need to be treated with optimal toxin and antioxidant management, the treatment measures for cancer must generally be pushed to higher dosing and greater variety versus the treatment of most other medical conditions.

As with all diseases, cancers result when tissue areas develop and maintain increased oxidative stress, primarily within the cell. However, cancers are also characterized by higher degrees of elevated oxidative stress than are seen in other conditions. For metastatic cancer, the degree of oxidative stress is typically just below the amount of oxidative stress it takes to finally result in cancer cell death, by either necrosis (cell rupture) or death without rupture (apoptosis, or programmed cell death). As all increased intracellular oxidative stress originates from excess toxicity, inadequate antioxidation, and decreased electron availability, the optimal therapy for a given cancer depends on resolving new

or ongoing toxin source(s), while neutralizing and chelating or excreting the toxins that have already accumulated in the body. Along with such toxin modulation, attention must also be given to optimizing the reduction (chemical normalization) of the biomolecules that have already been oxidized.

## Primary Toxin Sources

All toxins come from two primary sources:

- ✓ Infections
- ✓ Pure toxins, unrelated to an infectious origin

In the infection category, the most significant source of clinically consequential toxins that readily promote virtually all diseases comes from the oral cavity. This typically manifests as concentrated focal infections, such as abscessed teeth and tonsils, or less concentrated but more diffuse areas of pathogen growth, as seen in chronic pathogen colonization (CPC) and chronic gum disease (periodontitis). For greater detail, see Chapter 2.

Since the pandemic and the subsequent widespread COVID vaccinations and booster shots, the persistent presence of spike protein in millions of individuals worldwide has become a major disease-causing factor, provoking variable degrees of increased oxidative stress in most tissues and organs of the body. Although technically part of the COVID pathogen, the spike protein can persist on its own for years after COVID infection, or more commonly, after repeated rCOVID shots, provoking oxidative stress as long as it remains. This persistent presence is no longer related to an active COVID infection, but to the independent ability of the spike protein to continually reproduce itself. As such, the spike protein can technically be classified as either an infection-related toxin or a pure toxin that persists long after the disappearance of the COVID-19 pathogen. For greater detail, see Chapter 4.

Regarding pure toxins, the list is nearly endless and continues to expand daily. Hundreds of thousands to even millions of them exist. Some inflict minimal oxidative damage due to their chemical char-

acteristics, limiting what biomolecules can be accessed, while others (like inhaled cyanide) can kill in a minute or two. However, despite the enormous number of pure toxins in existence, the ongoing infection-generating toxins are statistically much more significant in the amount of disease and mortality that they cause.

Nevertheless, some pure toxins are more consequential clinically than others when they excessively accumulate in the body's critical areas and organs. Heavy metals such as mercury, antimony, and lead are important examples of this. All treatment protocols should involve the regular dosing of some toxin-mobilizing or chelating agents to decrease the overall level of oxidative stress or inflammation in the body that is continually generated by these substances. For more detailed information, see Chapter 5.

## Constructing a Treatment Protocol

Comprehensive treatment protocols will be very similar for a wide range of conditions due to the common causes (toxins) of excess oxidation. However, the availability of treatment options, the economic status of the patient, and the patient's motivations to do as much (or as little) as possible in dealing with their disease are critical factors in constructing a protocol. As such, there is no perfect protocol, and an active interplay between the physician or healthcare professional and the patient is essential in deciding whether to add or abandon a given part of a treatment regimen. All cancer patients should receive one or more bio-oxidative therapies, as these work to both kill pathogens and improve general antioxidative status. Discussed in greater detail in Chapter 16, none of the bio-oxidative therapies, alone or in combination, result in any significant adverse side effects. In comparison to traditional therapies, clinical improvements are the norm, and these therapies continually strengthen the immune system, unlike the immunosuppression that is routinely seen with chemotherapy. Focal radiation therapy that can attack only the cancer while largely avoiding normal cells represents the exception

to the otherwise immune system-damaging chemotherapy that is offered by mainstream medicine and oncology to cancer patients.

An optimal cancer treatment protocol should always include:

- ✓ Complete diagnosis and appropriate treatment of all sources of focal infection and chronic pathogen colonization, especially in the oral cavity (see Chapter 2)
- ✓ Highly dosed vitamin C (a bio-oxidative therapy), in one or more of the following forms: intravenous administration, between 50 and 100 grams per day for several days a week, preferably accompanied by oral or intravenous hydrocortisone (See Chapter 11), and oral vitamin C, either liposome-encapsulated or "regular" vitamin C (ascorbic acid or sodium ascorbate), roughly ranging roughly between 5 and 15 grams daily, also accompanied by hydrocortisone
- ✓ Olive leaf extract orally to provide roughly 50 mg of hydroxytyrosol daily, working to permit endogenous liver production of vitamin C; also 5 mg daily of metadichol®, a nano lipid form of policosanol
- ✓ Hydrogen peroxide (a bio-oxidative therapy) nebulization, initially daily and subsequently based on clinical response (normalization of gut function)
- ✓ Applications of ozone, ultraviolet blood irradiation, and Hyperbaric oxygen therapy (bio-oxidative therapies), whenever possible
- ✓ Normalization of critical hormone deficiencies, especially estrogen, testosterone, thyroid, and cortisol
- ✓ Super 8 supplementation, with the ability to increase individual dosing as desired, depending on clinical response (see Appendix A)
- ✓ Any other preferred oral nutrient supplementation per discretion of the healthcare professional and/or patient

## Breast Cancer Treatment

Based on all the information and research data presented above, it is essential to have as complete a diagnosis of the oral cavity as possible. This requires having a cone-beam computed tomography (CBCT or "3D X-ray") scan properly performed and expertly interpreted. This is the best way to avoid the possibility that a minimally abscessed tooth will be missed, as even one infected focus left behind can prevent much of the benefit of removing multiple other infected teeth and root canals and singularly cause cancer or another chronic degenerative disease by itself. A comprehensive protocol for optimizing the benefits of eliminating infected teeth is addressed in detail elsewhere. This includes a recommended and detailed surgical protocol for the dentist performing the extractions. Optimal healing is also strongly supported by a dentist experienced in the proper application of ozone to accelerate quality healing.[1]

**All treatment protocols should involve the regular dosing of some toxin-mobilizing or chelating agents to decrease the overall level of oxidative stress or inflammation in the body that is continually generated by these substances.**

While other factors may be involved, it appears likely that men have virtually no breast cancer because the amount of breast tissue is so much smaller than in women. There is significantly less toxic and infected lymph from oral cavity infections being continually filtered through that tissue. And even though there is a large difference in the average amount of breast tissue between men and women, the lymphatic drainage patterns are essentially the same.[2] Also, larger and denser breasts, along with overly constrictive bras and clothing, can all impede the rate at which lymph can be conducted through the breasts. Anything that slows lymphatic flow and promotes pockets of accumulation, especially if it contains a significant amount of toxins or pathogens, will be a factor in determining whether

substantial inflammation develops in an area of the breast that drains lymph from the oral cavity. Consistent with this concept, studies have shown that very large-breasted women who undergo breast reduction surgery lower their chances of breast cancer.[3] Furthermore, it has been shown that women with larger breasts fare worse with breast cancer than women with smaller breasts.[4]

## Uninformed Consent?

While it is the purported standard of care to make sure the patient is completely aware of the nature of a procedure and its potential complications, informed consent does not currently exist routinely for the root canal procedure. Root canal-performing dentists are either unwilling or unaware enough themselves to provide the patient with even a tiny fraction of the information in this book, which documents that ALL root canal-treated teeth are chronically infected and remain that way until they are properly extracted. The current root canal procedure should be limited to patients who are ***aware*** of the health risks but do not want a grossly infected tooth extracted for any reason. In that patient subset, having an expertly performed root canal that debulks the amount of infection in the targeted tooth can offer benefits relative to doing absolutely nothing. Most patients will opt to protect their health rather than keep the tooth. But the options should be made very clear before proceeding.

The devastating impact on the body's health from keeping infected teeth in the mouth cannot be overstated. Breast cancer is one of many chronic diseases ***caused and supported*** by oral cavity infections. The documentation is also clear that heart attacks are almost entirely due to oral pathogens metastasizing into and colonizing the coronary arteries.[5] Although focal infections and chronic pathogen colonization have been shown to be the culprits that cause and sustain nearly all chronic disease, the evidence is especially overwhelming for breast cancer and heart disease, which together claim more than 50% of deaths in developed countries around the world.

## Chapter 20

*Great things can happen when you don't care who gets the credit.*
Mark Twain

# Treating Diabetes and Dementia

## Underlying Pathology

As discussed in Chapter 8, both diabetes mellitus (DM) and dementia have especially low levels of intracellular vitamin C. Both can easily be characterized as conditions with advanced intracellular scurvy. It was also noted that dementia and DM appear pathophysiologically related, as DM is associated with a 50% increased risk of dementia, with dementia referred to by some authors as "type 3 diabetes." Because of this fact, any effective treatment for either of these conditions must involve particularly aggressive measures designed to normalize, or at least substantially improve, intracellular vitamin C throughout the body and in the brain.

It was also noted that DM is, in every sense of the word, an epigenetic disease, or at least the direct ***consequences*** of an epigenetic disease. In most animals, the liver serves to convert glucose stores and circulating glucose into vitamin C by a four-enzyme sequence. However, in most humans, the fourth enzyme, L-gulonolactone oxidase (or GULO), fails to make the final changes

necessary for the synthesis of vitamin C. What this means is the following:

> **The *primary* role of glucose in the body is to continually feed its metabolic conversion into vitamin C in the liver. In the vast majority of humans, this ability has been lost, and glucose is much more prone to accumulation rather than metabolic consumption, laying the primary foundation for the eventual development of overt DM in these individuals.**

Furthermore, this accumulation of excessive glucose in the blood also works against the uptake of extracellular and circulating vitamin C into the cells. The direct competition for the GLUT cell membrane transporters between glucose and vitamin C assures that much less vitamin C is assimilated as long as blood glucose levels predominate relative to blood vitamin C levels on a chronic basis.

When this epigenetic defect in the liver is "combined" with the sugar and carbohydrate-laden diets consumed by so many people today, the eventual development of overt DM becomes increasingly likely. However, if everybody had the functioning GULO enzyme in their livers, DM would be an extremely rare condition.

## Specific Treatment Considerations

In addition to the "standard" approaches to the management of DM (appropriate diet, glucose control with insulin or an appropriate oral hypoglycemic agent), the following suggestions should be part of the treatment protocol:

- ✓ Complete oral cavity evaluations with elimination of focal infections (gums, teeth, tonsils, cavitations)
- ✓ Elimination of chronic pathogen colonization (CPC) in the oral cavity, nose, and throat (typically with hydrogen peroxide nebulization).

This can help significantly in normalizing a pathogen-ridden and toxic, leaky gut.

- ✓ One or more bio-oxidative therapies to resolve or combat areas of CPC throughout the body
- ✓ Super 8 supplementation (see Appendix A)
- ✓ Olive leaf extract supplementation to reach roughly 50 mg of hydroxytyrosol intake daily (possibly reversing or lessening the epigenetic defect of no vitamin C synthesis in the liver), which would also increase consumption of blood glucose in the process. And/or metadichol® supplementation at 5 mg daily to lessen and possibly reverse the epigenetic defect that blocks vitamin C synthesis in the human liver.
- ✓ Highly-dosed magnesium, which directly works to decrease insulin resistance. Liposome-encapsulated magnesium, along with an initial series of intravenous magnesium applications, can have a tremendous positive clinical impact.
- ✓ Regular hydrocortisone administration along with first morning doses of vitamin C

**The *primary* role of glucose in the body is to continually feed its metabolic conversion into vitamin C in the liver. In the vast majority of humans, this ability has been lost...**

Regarding dementia specifically, the last four supplements of the Super 8 must be taken in a high dose. Dementia responds well to all four electron transfer chain-supporting supplements, but responds exceptionally well to niacinamide and methylene blue. It's also important to ensure that multigram doses of vitamin C are taken in conjunction with niacinamide. Both NAD and ATP levels in the nervous system

increase significantly in response to this approach, and all nervous system diseases, including dementia, respond very well.

## Chapter 21

*Repetition does not transform a lie into a truth.*
Franklin D. Roosevelt

# Treating Osteoporosis

## Treatment Overview

Although it is one of the most popular supplements in the world today, calcium should never be taken in supplemental form. Anyone with any disease already has too much calcium inside the affected cells, and supplemental calcium will only work to sustain and even further increase cellular calcium levels and intracellular oxidative stress. The permissible amount of dietary calcium is less restrictive, especially when blood vitamin D3 levels are normal. Nevertheless, dairy sources of calcium should be minimized.

The restrictions on dairy mainly apply to the water-soluble components of milk and the products derived from these components. However, the fat-soluble portions of milk have significant nutritional value and relatively small amounts of calcium. Dairy products, such as butter and cream, can be ingested without any significant concerns regarding calcium content.

Calcium supplementation alone does not strengthen osteoporotic bone and make it less susceptible to fracture. On the other hand, properly dosed vitamin D3 improves bone quality while decreasing the chances of osteoporotic fractures. Total calcium intake (dietary and supplemental) increases all-cause mortality in patients with the highest intake levels compared to those with the lowest intake levels.

Supplements that help to lower and optimize calcium levels inside cells and decrease all-cause mortality include vitamin C, magnesium, vitamin D3, and vitamin K2.

## Osteoporosis: Focal Scurvy of the Bones

As described in Chapter 1, all disease is characterized by inflammation, meaning a advanced vitamin C deficiency, in the affected tissues. Focal scurvy is an accurate description of the pathophysiology of any area with sufficiently increased oxidative stress. This vitamin C deficiency in osteoporotic bone is well-supported by the following points established in the literature:

- ✓ A chronic state of inflammation in the body, as reflected in increased C-reactive protein levels, reliably predicts an increased risk of osteoporotic fractures in elderly women.[1-2]
- ✓ Increased levels of other inflammatory parameters also correlate with an increased risk of fractures.[3-4]
- ✓ High doses of vitamin C have been shown to significantly reduce elevated levels of C-reactive protein and other markers of inflammation.[5-7]
- ✓ Osteoblasts, the bone-forming cells, are stimulated to develop from precursor cells by vitamin C.[8]

- ✓ The precursor cells from which osteoblasts develop are stimulated to proliferate by vitamin C.[9]
- ✓ Vitamin C is essential for the formation of the type of collagen required for the accelerated growth of osteoblasts.[10]
- ✓ Osteoclasts, the bone-destroying cells, are inhibited by vitamin C.[11]
- ✓ Net bone mass loss, accompanied by demineralization and loss of ***integrated*** calcium, is accelerated when vitamin C levels become sufficiently depleted.[12]
- ✓ The cross-linking of bone collagen (comprising 90% of the bone matrix protein) required for structural strength is stimulated by vitamin C.[13]
- ✓ [V]itamin C, ***in the absence of calcium supplementation***, resulted in significantly greater bone mineral density at all bone sites tested.[14] This indicates that the improvement in density involved all the elements needed to form healthy bone, without the misleading cosmetic effect caused by calcium supplementation in this test.
- ✓ In mice with ovaries removed, vitamin C administration prevented the bone loss

**All the measures that are effective in helping to reverse osteoporosis work to decrease the oxidative stress in the affected bones, while supplying the most appropriate agents and building blocks to build new bone.**

that would otherwise occur. This indicates that vitamin C is a bone-building agent, providing bone protection comparable to that afforded by normal estrogen levels.[15]

## Osteoporosis Reversal

All the measures that are effective in helping to reverse osteoporosis work to decrease the oxidative stress in the affected bones, while supplying the most appropriate agents and building blocks to build new bone. Agents that actively work in osteoporosis reversal, as well as in maintaining healthy bone, include the following:

### Vitamin C

- ✓ Osteoporosis is bone scurvy. See above for supporting data.
- ✓ Decreases bone resorption while increasing bone synthesis
- ✓ Highest vitamin C levels correlate with the lowest risk of fracture
- ✓ Decreases all-cause mortality
- ✓ No established toxic levels of intake

### Magnesium

- ✓ A calcium channel blocker that also works to dissolve abnormal calcium deposits[16-18]
- ✓ Increases bone density and decreases fracture incidence[19]
- ✓ Decreases all-cause mortality[20-21]
- ✓ No significant toxicity

## Vitamin K

- ✓ Activates proteins that inhibit ectopic calcification[22]
- ✓ Works to dissolve abnormal calcium deposits[23]
- ✓ Improves bone quality and decreases fracture incidence[24-26]
- ✓ Decreases all-cause mortality[27]
- ✓ No significant toxicity[28]

## Vitamin D

- ✓ Normal vitamin D levels help ensure normal calcium absorption from the diet.
- ✓ Critical for regulating numerous genes[29]
- ✓ Deficiency causes osteoporosis[30]
- ✓ Excess worsens osteoporosis[31]
- ✓ Key determinant of bone mineral density in reaching maturation[32]
- ✓ In the therapeutic range, decreases all-cause mortality[33-34]

## Essential Fatty Acids

- ✓ Some with calcium channel blocking activity[35-36]
- ✓ Afford protection against loss of bone mineral density[37-38]
- ✓ Higher blood levels, less mortality[39]
- ✓ No significant toxicity

## Estrogen

- ✓ A calcium channel blocker that works to inhibit ectopic calcification[40-42]
- ✓ Decreases fracture incidence[43]
- ✓ Deficiency increases all-cause mortality[44]

### Testosterone

- ✓ A calcium channel blocker that works to inhibit ectopic calcification[45-46]
- ✓ Deficiency increases fracture risk[47]
- ✓ Deficiency increases all-cause mortality[48-49]

### Thyroid Hormone

- ✓ Necessary for early skeletal development and the establishment of peak bone mass[50]
- ✓ High and low thyroid function increases fracture risk[51]
- ✓ Minimally high thyroid function and minimally low thyroid function are risk factors for increased all-cause mortality[52-53]

**When deciding on the healthiest amounts of calcium to ingest and considering the likelihood that too much calcium is already present inmost adult bodies, the different causes of excess calcium presence need to be taken into account.**

## Practical Suggestions for Calcium Intake

In large part, the marketing efforts of the dairy industry have dictated the recommended daily intake of calcium. Rarely have these recommendations been seriously challenged. Instead, they have just been accepted as true.

The medical literature has an abundance of studies on calcium intake and the incidence of different chronic degenerative diseases, especially heart disease and cancer. Even in extensive studies, many of the results and conclusions are in ***complete contradiction to one another***. However, a consistent finding among these studies is that lower amounts of dietary

calcium can be beneficial, while higher amounts of dietary calcium can support disease.

There is also uncertainty regarding the potential harm of calcium supplementation, although there is general agreement that excessive daily intake of calcium supplements can provoke and exacerbate chronic disease.[54-65]

While calcium can undoubtedly be considered a nutrient, it is not a nutrient in the traditional sense of the word. Most calcium supplementation is given with the idea of slowing or reversing osteoporosis. In otherwise healthy, mature bones, a minimal amount of calcium is required to participate in the ongoing synthesis and breakdown that occurs in their active physiology. It is generally accepted that the need for calcium is greater in young, actively growing bone than in adult bone. When considering how much new calcium needs to be assimilated daily, it is essential to remember that older adults, especially women, are ***already*** actively releasing large amounts of calcium continuously as part of the general bone deterioration and increased rate of oxidation associated with osteoporosis and aging. This is never factored into determining the amount of daily calcium exposure/intake the body needs.

When deciding on the healthiest amounts of calcium to ingest and considering the likelihood that too much calcium is already present in most adult bodies, the different causes of excess calcium presence need to be taken into account. The more of these factors that are present and pronounced, the greater the chances that significant calcium excess is already present, that calcifications already exist throughout the body, even if not detected, that intracellular calcium levels are already elevated, and that even less new calcium needs to be ingested. These causes include:

- ✓ Excess calcium intake (supplementation and/or diet)
- ✓ Excess calcium mobilization from the bones (osteoporosis and osteopenia)
- ✓ Deficiencies of vitamin C and other essential antioxidants
- ✓ Excess toxin presence, especially from sites of chronic infection and inflammation.
- ✓ Deficiencies of critical regulatory hormones (especially sex hormones, thyroid, and cortisol)
- ✓ Deficiencies, especially of magnesium, vitamin D3, and vitamin K2

The best way to assure a "normal" daily intake of calcium in the diet is to eat a reasonably balanced diet with minimal dairy, while maintaining a normal vitamin D3 level (50 to 100 ng/cc) in the blood. Vitamin D3 helps optimize appropriate calcium absorption from the diet while facilitating the optimal incorporation of calcium into new or healing bone.

The importance of vitamin D3 in normalizing calcium and bone metabolism comes from several studies showing that vitamin D3 supplementation ***alone*** (at a dose of 800 or more IU daily) resulted in fewer fractures in osteoporotic patients. In contrast, calcium supplementation alone did not prevent fractures.[66-72] In one study, a small dose (400 IU) of vitamin D3 and a relatively large amount of calcium (1,000 mg elemental) did not reduce the likelihood of hip fractures. Still, they ***did*** increase the risk of kidney stones.[73]

The combination of calcium and vitamin D3 was also found to increase the risk of cardiovascular events.[74] Furthermore, much of the "literature support" for giving calcium for fracture preven-

tion comes from studies that gave BOTH calcium and vitamin D3. However, in the conclusions of these studies, it was merely asserted that calcium prevented fractures, completely ignoring the fact that vitamin D3 was also being administered. It appears that the researchers felt pressure to conclude that calcium prevents fractures, leading to a flawed conclusion that overlooked the presence of vitamin D3 in the protocols. Evidence also suggests that combining calcium supplementation with vitamin D3 supplementation increases the risk of kidney stone formation.[75]

**The importance of vitamin D3 in normalizing calcium and bone metabolism comes from several studies showing that vitamin D3 supplementation *alone* (at a dose of 800 or more IU daily) resulted in fewer fractures in osteoporotic patients.**

So, what should be ingested and what should not be eaten? Milk has fat-soluble and water-soluble portions. It is best to minimize the intake of dairy products derived from the water-soluble portion, which has the highest calcium content (milk, cheese, yogurt). More practically, the main emphasis would be to avoid milk as a beverage and consume small portions of cheese and yogurt a few times a week. Ironically, skim milk is the worst, since the fat is largely removed. Skim milk has the least nutrition and the most calcium that the milk has to offer. Alternatively, the fat-soluble portion of milk contains the portion that is nutrient-rich and calcium-poor. Sour cream, heavy cream, and butter can be consumed as desired without concern for excess calcium intake. For the cereal consumers, dilute heavy cream (or heavy whipping cream) with one-third to one-half water or non-calcium-enriched plant milks (like rice milk) as a milk substitute to pour over the

cereal. Of course, the cereal should be organic or at least unadulterated (no added iron or sugar).

Calcium as a supplement should be avoided altogether, unless the total daily supplemental amount is roughly 100 mg or less. Notably, antacids containing calcium carbonate (which is the case with most of them) should be avoided entirely. Unfortunately, calcium carbonate is exceptionally effective in quickly relieving the discomfort of an acidic stomach, which makes it difficult for many patients with frequent stomach upset to avoid.

Supplements that need to be taken regularly to improve bone health and to help keep intracellular calcium levels at or near normal levels are:

- ✓ Vitamin C
- ✓ Magnesium
- ✓ Vitamin D3
- ✓ Vitamin K2

Because of the ability of excess intracellular calcium to promote death from all causes, it is noteworthy that each of these four calcium-lowering supplements has been shown individually to reduce all-cause mortality.[76-82]

# Section Four

## Appendices, Index, and References

Appendix A

# Baseline Supplementation Protocol

## The Super 8

Supplements that work to normalize the elevated calcium levels seen in all diseased cells:

- ✓ Vitamin C. Depending on bowel tolerance, 3,000 to 9,000 mg (or more, if desired) in divided doses daily. Optimal impact will be seen if 10 to 20 mg of hydrocortisone can be taken with the first morning dose.
- ✓ Magnesium chloride, 1,000 to 3,000 mg daily in divided doses, depending on bowel tolerance. Liposome-encapsulated magnesium threonate can be taken instead, 1,000 to 2,000 mg daily.
- ✓ Vitamin D3, usually between 3,000 and 10,000 international units daily, to reach and maintain a blood level between 50 and 100 ng/cc
- ✓ Vitamin K2, 500 micrograms daily (much larger dosing is fine, as it is exceptionally nontoxic)

- ✓ Supplements that work to normalize/optimize ATP production inside the mitochondria:
- ✓ Niacinamide, 1,000 to 3,000 mg daily
- ✓ Riboflavin 400 mg daily
- ✓ Coenzyme Q10, 600 to 1,000 mg daily
- ✓ Methylene blue, 25 mg daily

Two additional supplements that can optimize everything else by restoring to the human liver the ability to synthesize vitamin C by overcoming the epigenetic defect blocking normal production of the fourth enzyme needed to synthesize vitamin C from glucose:

***Olive leaf extract*** daily to supply roughly 50 mg of ***hydroxytyrosol*** (different supplement companies have different hydroxytyrosol content in their olive or olive leaf extract products). Or 5 mg daily metadichol®, a nano lipid form of policosanol.

Many good supplements aside from the Super 8 and the VC synthesis-supporting supplements are available, and nobody should feel they need to stop taking something that they can afford and that they feel is having a positive impact on their health. However, it is not advised to replace any of these recommended supplements in deference to any other supplement. The Super 8 supplementation protocol is designed to optimize/normalize intracellular oxidative stress by maintaining low intracellular calcium levels and high intracellular levels of vitamin C and ATP.

## Appendix B

# Unknown and Little-Known Facts to Take Away from this Book

### In Chapter 1...

- ✓ The literal fuel of the body is electrons. Total electron content and optimal electron flow (microcurrent) determine overall health.
- ✓ Oxidized biomolecules are electron-depleted. Reduced (normal) biomolecules retain their electrons.
- ✓ Oxidized biomolecules lose their normal biochemical functions in cellular metabolism.
- ✓ The quantity of oxidized biomolecules defines oxidative stress. The more biomolecules oxidized, the more pronounced the oxidative stress.
- ✓ Increased intracellular biomolecule oxidation (IBO), or increased intracellular oxidation, does not cause disease; it ***IS*** the disease.
- ✓ The unique array of oxidized biomolecules (type, concentration, location, chronicity) determines the nature of the clinical disease.
- ✓ The ***only*** cause of increased IBO is exposure to toxins, also known as pro-oxidants or poisons.
- ✓ A toxin cannot have a toxic impact if it does not oxidize biomolecules and permanently keep

the electrons it takes from those biomolecules, thereby depleting the body's electron pool.

- ✓ All antitoxins are antioxidants. An antioxidant can repair (reduce) an oxidized biomolecule, and it can quench the electron-seeking toxin before it oxidizes a biomolecule.
- ✓ All disease results from excess toxins and/or insufficient electron donation and distribution by antioxidants.
- ✓ Currently, the three primary disease-causing toxin sources are toxins generated by pathogens, the persistent spike protein toxin from chronic COVID or following COVID vaccines and boosters, and pure toxin exposures, primarily from heavy metal accumulations.

## In Chapter 2...

- ✓ Pathogen-generated toxins, especially from oral cavity infections, are the most significant disease-causing agents, statistically speaking.
- ✓ Most pathogens present focally, as with an abscess, or as an area of low-grade, chronic growth (chronic pathogen colonization, CPC).
- ✓ CPC in the nose and throat is the primary cause of chronic gastrointestinal disease (pathogen-ridden microbiome, leaky gut)
- ✓ All treatment protocols should minimize the introduction of new toxins, maximize the presence of antioxidants, and address important hormone deficiencies.

## In Chapter 3...

- ✓ All diseased cells have elevated intracellular calcium levels and increased oxidative stress.

- ✓ Calcium supplementation and excessive dairy intake should be avoided.
- ✓ Copper should never be supplemented.
- ✓ Iron should never be supplemented unless a specific iron deficiency anemia is present.
- ✓ "Enriched" food means there is added iron, often in the form of metallic iron filings.
- ✓ Fluoride is a toxin that needs to be avoided as completely as possible.
- ✓ Poor digestion is a significant source of chronic toxin exposure, often resulting from a leaky gut, a pathogen-ridden microbiome, and food that has spoiled and putrified in the gut.
- ✓ The single most important promoter of poor digestion is poor food combining.

## In Chapter 4...

- ✓ The persistent spike protein (PSP) syndrome most commonly follows multiple COVID-19 vaccinations and boosters.
- ✓ The spike protein, as well as its fragments, is highly toxic.
- ✓ PSP probably affects many millions of people now across the planet.
- ✓ The spike protein affects all organs and tissues in the body, especially the heart.
- ✓ The spike protein can be free or encapsulated in exosomes.
- ✓ D-dimer levels, reflecting increased blood clotting, are often also markers of circulating spike protein.
- ✓ Nearly all deceased COVID patients have bodywide blood clotting at autopsy.
- ✓ Effective treatment modalities for PSP include hydrogen peroxide (HP) nebulization, vitamin C, ivermectin, other bio-oxidative

treatments, and Super 8 supplementation with olive leaf extract and/or metadichol®.

- ✓ HP nebulization has been repeatedly successful in curing advanced COVID as a monotherapy.
- ✓ A UV blood irradiation protocol using only a frequency of 254 nm, along with oxygen and a precise application method, has repeatedly cured chronic COVID-19 with normalization of elevated D-dimer levels.

## In Chapter 5...

- ✓ Excess toxin accumulation in the form of heavy metals, especially mercury and antimony, is frequently the primary cause of cardiomyopathy and heart failure.
- ✓ PSP appears to target hearts with greater accumulations of heavy metals.
- ✓ Proper toxin chelation, mobilization, and excretion often dramatically improve advanced heart failure.
- ✓ PSP can cause fatal cardiac arrhythmias without affecting enough heart muscle to elevate blood troponin levels.
- ✓ Elevated ECG PR intervals were found in many pilots following COVID vaccinations. The FAA then "redefined" the length of a normal PR interval by making it substantially longer.
- ✓ Elevated PR intervals in adults result in increased atrial fibrillation, heart block, and mortality.
- ✓ Cardiomyopathy routinely demonstrates decreased ATP production. Supplemental support of the electron transport chain in the mitochondria can result in significant clinical improvement.
- ✓ Especially supportive supplements for the mitochondria and ATP production are niacinamide, riboflavin, coenzyme Q10, and methylene blue.

## In Chapter 7...

- ✓ The breasts are a predominant area of lymphatic drainage for the oral cavity.
- ✓ A 10-fold (1,000%) increase in bacterial load has been found in breast tumors relative to normal breast tissue.
- ✓ Most breast cancer patients have identifiable sources of oral pathogens draining into the breast.
- ✓ A cone-beam computed tomography (CBCT) examination is essential for identifying all oral cavity infections.

## In Chapter 8...

- ✓ Diabetes mellitus (DM) and dementia have especially severe depletion of vitamin C inside the cells.
- ✓ Many researchers call dementia "type 3 diabetes." (DM is also known as type 2 diabetes.)
- ✓ DM results from an epigenetic defect in the human liver, where the fourth enzyme in a four-enzyme sequence fails to function, thereby preventing the conversion of available glucose into vitamin C.
- ✓ Failure to convert glucose naturally into vitamin C promotes glucose accumulation. Additionally, the synthesis of new glucose that accompanies the release of cortisol from the adrenal glands further exacerbates this glucose accumulation. This is not the case with most wild animals, and DM does not occur in them, either.
- ✓ Insulin promotes the cellular uptake of both glucose and vitamin C. The one with the highest blood levels gets the most help in cellular uptake. Chronically high glucose levels further keep intracellular vitamin C levels especially low in DM.

- ✓ NAD synthesis, supported by supplemented niacinamide, is vital in the treatment of dementia and all other nervous system disorders.

## In Chapter 9...

- ✓ The primary role of antioxidants, especially vitamin C, is to optimally distribute the available electron pool in the body, not to supply new electrons.
- ✓ Oxidized (electron-depleted) antioxidants work just as well as reduced antioxidants (no electron depletion) in treating infections and toxins.
- ✓ Oxidized methylene blue is very effective in treating septic shock, including as a monotherapy.
- ✓ All "new" electrons come from the diet, initially coming from the solar irradiation of plants.
- ✓ The ORAC test cannot determine the clinical effectiveness of an antioxidant.
- ✓ Vitamin C is the most critical antioxidant in the body, for multiple reasons.

## In Chapter 10...

- ✓ The primary factors impacting intracellular oxidative stress are calcium, magnesium, vitamin C, glutathione, and ATP.
- ✓ All these factors interact with each other in multiple ways.
- ✓ Magnesium is the most critical calcium-lowering supplement.
- ✓ In addition to the above factors, the hormones most significant in minimizing oxidative stress are the sex hormones, thyroid hormone, cortisol (also known as hydrocortisone), and insulin.

- ✓ By actively promoting the cellular uptake of vitamin C, insulin is one of the most powerful healing agents in existence.

## In Chapter 11...

- ✓ The only purpose of the immune system is to relieve inflammation and restore inflamed tissue to a normal state.
- ✓ A vitamin C-depleted tissue is inflamed, and any tissue that is inflamed is depleted of vitamin C. Inflammation and vitamin C depletion, often severe, ***mean the same thing*** concerning the tissue being affected.
- ✓ Inflamed tissue triggers an acute stress response, during which the adrenal glands release cortisol into the bloodstream.
- ✓ Inflamed tissue also triggers an acute immune response, bringing vitamin C-laden monocytes and other immune cells directly to the cells most depleted of vitamin C.
- ✓ Cortisol and synthetic corticosteroids are incorrectly regarded as powerful, primary anti-inflammatory agents. They are not, however.
- ✓ Cortisol serves the ***primary*** role of enhancing and optimizing the uptake of ***available*** vitamin C into the body's cells.
- ✓ Acquiring a new infection means cortisol and/or vitamin C status are deficient in the body, allowing the infection to take hold.
- ✓ The impact of cortisol is always enhanced by vitamin C administration, and vice versa.
- ✓ Low vitamin C levels in the body and cells chronically stimulate increased cortisol release.
- ✓ Cortisol administration to augment vitamin C uptake is ***exceptionally safe***, as

it is a hormone replacement for what the body is no longer adequately producing.

- ✓ Synthetic corticosteroids (prednisone, dexamethasone, etc.) should never be prescribed. Cortisol and vitamin C together take care of all the clinical "indications" for these drugs with no chance of long-term corticosteroid overdose damage (diabetes, muscle wasting).
- ✓ The primary role of the immune system and the immune response is to restore vitamin C levels to normal in inflamed cells and tissue, ***nothing more***.

## In Chapter 12...

- ✓ The chemical properties of vitamin C make it unique among all antioxidants, and it is the most valuable molecule in the body for reaching and maintaining optimal health.
- ✓ A severe and chronic lack of vitamin C intake results in the uniformly fatal disease, scurvy.
- ✓ Properly dosed, vitamin C has cured all acute viral syndromes and provides strong support for the resolution of all other infectious diseases.
- ✓ Properly dosed, vitamin C has been shown to neutralize all acute toxin overdoses or overexposures, as long as the patient was not too advanced when first seen.
- ✓ The three most essential factors in vitamin C therapy are "dose, dose, and dose."
- ✓ Providing vitamin C in multiple forms consistently offers added benefits compared to administering it in just one form.
- ✓ Vitamin C does not cause kidney stones, but it helps prevent and resolve them.
- ✓ There has never been a documented toxic intake of vitamin C. No other agent has this level of safety upon ingestion.

## In Chapter 13...

- ✓ Magnesium is the most essential mineral in the body, and it is the primary factor in controlling the disease-causing elevation of intracellular oxidative stress that occurs with excessive calcium.
- ✓ Low mitochondrial (intracellular) levels of magnesium help precipitate cardiac arrhythmias and nervous system seizure disorders.
- ✓ A completely normal mitochondrial magnesium level prevents the heart cells from initiating extra beats and arrhythmias.
- ✓ A completely normal Holter monitor examination is the best assurance of having normal, or normal-enough, intracellular magnesium levels.
- ✓ Chronic COVID and PSP patients need regular Holter monitor studies to assure their magnesium levels are adequate and that they are not at high risk of sudden, fatal arrhythmias.
- ✓ Toxin overdoses and overexposures are best treated with vitamin C and magnesium, since a prolonged QT often initiates a fatal arrhythmia, and magnesium intravenously can promptly shorten this interval into a safe range, and the VC reduces oxidized biomolecules.
- ✓ Magnesium supplementation is available in many oral forms. If deficiencies exist, a course of intravenous administration can be given to accelerate the restoration of normal or near-normal levels. Liposome-encapsulated magnesium threonate is excellent at elevating and maintaining intracellular magnesium levels in the desired range.

## In Chapter 14...

- ✓ DRI and RDA "official" supplement recommendations are ridiculously low.

- ✓ 11 of 13 essential vitamins have been shown to individually decrease all-cause mortality.
- ✓ Schizophrenia and all other nervous system disorders have variable degrees of inflammation in the affected tissues. Schizophrenia can be regarded as a chronic encephalitis.
- ✓ Adequately dosed niacin or niacinamide, along with vitamin C, has consistently cured schizophrenia.

### In Chapter 15...

- ✓ Methylene blue (MB) has a comparable clinical impact to vitamin C. It is beneficial in the treatment of all infections and infectious diseases.
- ✓ MB is traditionally administered in its oxidized form, while vitamin C is typically administered in its reduced form.
- ✓ MB is enormously beneficial and severely underutilized in all forms of shock, including septic shock.
- ✓ MB travels throughout the body, including the central nervous system, and rapidly increases ATP production in the electron transport chain.

### In Chapter 16...

- ✓ An optimal treatment protocol must identify and eliminate all ongoing toxin exposures, as well as mobilize and eliminate toxin stores.
- ✓ One or more bio-oxidative therapies are essential for the optimal treatment of any medical condition. If only one is chosen, vitamin C is the best choice, as all diseases and infections already deplete the body's vitamin C stores. Vitamin C is best accompanied by the appropriate dosing of hydrocortisone (cortisol), NOT a synthetic corticosteroid.

- ✓ HP nebulization should be at least an initial part of any protocol, as gut function can rapidly normalize and stop gut-related dissemination of pathogens and toxins generated there.
- ✓ Magnesium must always be supplemented vigorously, as its deficiency in the body exacerbates all pathologies.
- ✓ Everyone should take Super 8 supplements, as well as hydroxytyrosol (olive leaf extract) or metadichol® to facilitate internal vitamin C synthesis.

## In Chapter 17...

- ✓ CPC is present in all diseased tissues and must be treated vigorously.
- ✓ HP nebulization must be at least an initial part of any CPC treatment protocol.
- ✓ A good biological dentist is vital to the management and elimination of all dental infections, in addition to resolving CPC.
- ✓ The worst thing anybody can do for their long-term health and ultimate survival is to select a "traditional" dentist who is completely unaware of, or possibly just dismissive of, the proper practice of biological dentistry.

## In Chapter 18...

- ✓ Coronary artery disease is always secondary to CPC of the coronary artery walls, inducing focal scurvy and a chronic inflammatory response that directly promotes wall-thickening atherosclerosis.
- ✓ Cone beam computed tomography (CBCT) of the oral cavity should be performed in all patients with suspected or documented coronary artery disease, as oral pathogens are consistently found in the CPC present in atherosclerotic plaques.

- ✓ Chelation therapy, whether prescribed or supplemental, is a crucial component in treating all heart conditions, particularly cardiomyopathy.
- ✓ Low-grade subclinical hypothyroidism must be diagnosed and treated appropriately to help protect against the dissemination of oral CPC to the coronary arteries and elsewhere.

### In Chapter 19...

- ✓ All cancers require a proper evaluation and treatment of the oral cavity.
- ✓ Multiple bio-oxidative therapies should be done, if possible, in cancer patients.
- ✓ All other aspects of treatment protocols are critical in all cancers, as pathogens have been identified as the primary causes of the focal increase in oxidative stress required to induce malignant transformation.

### In Chapter 20...

- ✓ DM and dementia require vigorous measures to support and increase intracellular levels of vitamin C, which is especially pronounced in these diseases.
- ✓ In addition to the other standard parts of the treatment protocols, Super 8 supplementation should be increased to higher doses, as determined on an individual basis with a chosen healthcare practitioner.

### In Chapter 21...

- ✓ Osteoporosis is effectively a scurvy of the bone. Every aspect of its pathology is strongly opposed by optimal vitamin C administration.
- ✓ In addition to the measures already outlined in the other standard treatment protocols,

osteoporosis treatment involves the optimal administration of vitamin C, magnesium, vitamin K, vitamin D, essential fatty acids, estrogen or testosterone, and thyroid hormone.

✓ All calcium supplementation should be avoided, and dairy intake should be minimized as much as possible. Fatty dairy products, such as cream and butter, can be consumed as desired.

## Appendix C

# Surgical Protocol for Extractions of Infected Teeth and Cavitation Surgery

### General Observations

Tooth extractions, especially of infected teeth like untreated teeth with chronic apical periodontitis (CAP) or those having received root canal treatments, and cavitation debridement are surgical procedures performed in the oral cavity that involve both the soft tissues of the mouth, such as the gingiva, and the bones of the maxilla and mandible. Strict adherence to surgical protocols, such as those practiced by orthopedic surgeons, should also apply to oral surgery procedures.

It is essential to remember that dentists, as surgeons of the oral cavity, are still operating on bone. Although the mouth is a more forgiving environment for soft tissue healing, infected bone is difficult to heal completely, regardless of its location in the body. Due to the inability to isolate and create a sterile field when operating in the mouth, the potential for developing a post-surgical infection in the jawbone is always a significant possibility.

Furthermore, the ability of the mouth to rapidly heal soft tissue infections often leads many dentists to believe that infected bone

in the mouth will heal just as readily, which is not necessarily the case. We now know how easily cavitations develop, and the seemingly complete X-ray appearance of healing after many routine dental extractions remains an illusion. Accepted surgical procedures must be followed throughout the body to optimize the chances of complete healing and clinical recovery.

If some of the periodontal ligament remains in the tooth socket after an extraction, or there is a failure to remove all of the infection in the jawbone, the remaining hole in the jawbone may not fill in with new bone. This void in the jawbone is called a cavitation, and by its very nature, it can be a fertile breeding ground for the same bacteria that initially infected the tooth. Because they are often surrounded by an intact jawbone with multiple "natural" defects, cavitations often escape X-ray detection. Therefore, to optimize the chances of complete healing and complete clinical recovery, accepted surgical procedures must be followed everywhere in the body, and especially in the mouth.

## Oral Surgery Protocol

1. A complete patient medical and dental history, including consultation with all treating physicians, is essential before treatment is rendered. As the mouth is not isolated from the rest of the body, such a complete history is important. Nearly all dental procedures, especially surgery, have systemic, body-wide effects.
2. A thorough dental evaluation of the hard and soft tissues of the oral cavity is essential. The examination should include all necessary X-rays (including CBCT), along with a comprehensive clinical exam that includes pulp vitality tests of the teeth to determine which teeth are healthy and alive and which may be unexpectedly nerve-dead and non-vital. Any additional tests that may aid in diagnosis and treat-

ment planning should also be performed. It is essential to note that pulp vitality tests play a crucial role in evaluating the health of teeth that have not undergone root canal treatments. A dead, non-vital tooth in the mouth can be just as serious as a root canal-treated tooth, as is the case with the untreated CAP tooth.

3. After the initial assessment of the patient's condition, a treatment plan must be established. If the treatment plan includes extractions and/or cavitation surgery, it is essential to seek a surgeon who is not only surgically skilled but who also can deliver intravenous medicines. Intravenous sedation is often necessary, and there must also be access for the administration of appropriate antibiotics. The ability to administer ozone in various ways is also crucial in facilitating rapid and healthy healing.
4. Alternative treatments involving the injection of various remedies, such as Sanum remedies, into the site of infection, such as the bone around a root canal-treated tooth or around other infected teeth, should not be performed. Similarly, such injections should not be made into cavitation sites. This does NOT apply to the various ozone applications. Many of these treatments exacerbate the disease process. Furthermore, some dentists advocate the use of these medications instead of surgery. It is impossible to restore dead bone to live bone again with any medication. Surgery must be performed to remove all of the dead and infected bone, as well as establish adequate perfusion of blood from adjacent healthy bone into the surgical site. This is the only way healing can occur.
5. Ideally, teeth should be cleaned approximately two weeks prior to surgery to reduce the amount of bacteria present in the mouth and decrease the risk

of postoperative infection. Laser curettage in the sulcus around each tooth can further reduce the presence of bacteria.

6. General medical clearance, when appropriate, should be obtained.
7. Written informed consent, signed by the patient, should be obtained before the planned procedure. All potential complications of the procedure should be thoroughly discussed and explained. It is preferable that a family member also participates in this consent, especially to help verify that all that has been discussed is fully understood. Consideration might be given to a videotaping of the discussion of the consent, which provides the dentist with further evidence that all information was discussed and was entirely understood by the patient. Since the advent of the smartphone, this can be more easily performed than ever before, and the recordings can be readily stored in computer files for easy access in the future.
8. Preoperative medications such as antibiotics should be administered.
9. The oral cavity should be cleansed with an appropriate antimicrobial agent.
10. Local anesthetics without a vasoconstrictor should be used. Vasoconstrictors lessen the blood flow in the injected area. Good blood flow to the surgical site is necessary to help assure the best chances of complete healing. Even the transient vasoconstriction produced by anesthetics with a vasoconstrictor can cause enough ischemia to injure the bone and cause local cell death.
11. Surgery should be performed to remove the entire lesion. The surgeon must be skilled in operating around the inferior alveolar nerve (the main nerve

that runs through the lower jaw) as well as operating through the sinus floor and into the sinus. Many times, the lesions seen around cavitations, root canal-treated teeth, and untreated CAP teeth are more extensive than they appear on regular X-rays. 3D cone beam imaging (CBCT) of the teeth should always be performed whenever possible to facilitate a more accurate surgical approach. It is essential to remove all diseased tissue. This means that the surgeon should be skilled in operating around all these anatomical structures. Otherwise, the patient should be referred to another surgeon.

12. Typically, the extraction of an infected tooth requires adequate exposure of the surrounding bone to ensure good visualization and access to the infected areas. This is obtained by laying a "flap," which simply means that the gum tissue is gently lifted off the bone. The word "gently" is emphasized here, as there is a thin layer of tissue that lies directly adjacent to the bone, called the periosteum, which must be treated with care. The periosteum is the tissue that supplies the outside of the bone with nutrients, and it is also where many of the sensory fibers that can cause post-operative pain are located. It must be treated with respect and handled gently. The kinder you treat the tissue during any operation, the fewer postoperative complications will occur, and the better the healing will proceed.
13. Surgical sites should be irrigated with a saline solution or an antibiotic solution that is acceptable for use in orthopedic surgery. It is essential to remember that bone is the tissue being subjected to surgery. Plain water should never be used, and medications that have not been evaluated for use in bone elsewhere in the body should also never be used for surgical sites in the jawbone.

14. Extractions should be performed as atraumatically as possible. This means that teeth with more than one root, such as molars, should usually be sectioned and each root removed individually. This technique avoids bone fractures and is gentler on the tissues. Dentists were taught in dental school to "expand the socket" by rocking teeth back and force. The term should be "crack the socket" because cortical bone does not stretch, and any expansion is obtained by breaking the surrounding bone. This should be avoided. Surgical removal of bone when indicated is a much better option. It should only be performed with a surgical handpiece (never a dental drill), accompanied by copious sterile saline irrigation (not plain water). Dental drills can introduce air into the surgical site that can form an air embolism. An air embolism is a dangerous situation that can cause death. Additionally, dental drills utilize plain water as an irrigant. This water is not sterile and is not physiologic in terms of salinity. Plain water can cause bone cells to die.
15. The remainder of the protocol addresses both the proper cleaning of the tooth extraction site, as well as the cleaning/debridement of a cavitation.
16. The approach to cavitation surgery is the same as the process followed to clean out the socket where an infected tooth was extracted. After tooth extraction, access to the diseased granulation tissue and bone at the bottom of the tooth socket can be readily obtained. Access to a cavitation site is gained by making a mid-crestal incision and reflection of a full-thickness mucoperiosteal flap to the buccal side of the jawbone and extending to the mucogingival fold. Using a round burr in a surgical handpiece and with copious saline irrigation, an opening is created

in the crestal bone that is large enough to allow complete access to the cavitation.

17. Removal of the infected and ischemic bone can be performed initially using a surgical drill at low revolutions per minute, accompanied by copious irrigation. It is essential to keep the bone temperature as cool as possible. The aggressive use of a surgical drill can cause an increase in bone temperature due to friction. The bone cells in contact with the drill will die. The procedure intends to remove dead bone cells and not to produce more dead cells in the process. Most of the surgical debridement should be performed by hand with surgical curettes.
18. The surgical site must be continuously flushed with an irrigation solution such as 0.9% saline solution.
19. Sometimes, bone grafting or sinus closure may be necessary. Be sure to discuss this with an experienced surgeon.
20. Closure of the surgical site should be accomplished with sutures.
21. Antibiotics should be administered postoperatively to prevent reinfection or systemic dissemination of the existing infection.
22. Sutures should be removed in seven to ten days.
23. Patients should be instructed to keep pressure on the surgical site by gently biting on surgical gauze. This helps control bleeding and keep the flap close to the bone during the initial healing phase.
24. Ice should be applied to the side of the face for twenty minutes, then removed for twenty minutes. This should be repeated throughout the entire day of surgery, but should not be used the following days.
25. The day after surgery, the patient should gently rinse with a mild, warm saltwater solution (1/4

teaspoon of salt in 8 oz of water). This should be done three to four times per day.

Cultures for aerobic and anaerobic bacteria, as well as for fungi, should be obtained immediately after extraction or entry into a cavitation site to get a "clean catch" sample. A clean catch sample is a sample that consists of only tissue within the surgical site without contamination. By ensuring good isolation and surgical suction, the surgical site will be free from external contamination, and the sample will only contain pathogens present within the surgical site, excluding those that may be introduced from the rest of the mouth.

These microbiological samples must be placed in the appropriate culture tubes, and the laboratory must be instructed to let them incubate for at least two weeks. Some anaerobic bacteria and fungi take a long time to grow, and discarding the sample after just a few days may miss the presence of consequential pathogens.

Bone tissue samples should be taken from all areas of the surgical site and sent for microscopic analysis by an oral pathologist. Acute and chronic osteomyelitis, osteonecrosis, and other disorders can be determined by microscopic evaluation. The results of the microbiological cultures and tissue pathology will help determine the need for any further treatment, such as appropriate oral or IV antibiotics. They will also validate the presence of infection and document a clear-cut reason for tooth extraction or cavitation debridement.

## Appendix D

# Resources

## Suggested Resources

The links below are provided only as generally interesting and useful websites and information resources. Dr. Levy does not specifically endorse or agree with all statements and assertions made on these websites.

### Biological (Holistic) Dentistry

In seeking a biological dentist, you need to make sure to your satisfaction that all of your concerns regarding the treatment(s) you want will be satisfactorily addressed. No two dentists are identical in what they offer and what they believe to be true.

https://iaomt.org/

https://iabdm.org/

https://www.biologicaldent.com/

https://biodentist.com/

https://hugginsappliedhealing.com/

https://assureasmile.com/

Another possibility is to go to Google, Yahoo, DuckDuckGo, or any other search engine and type in something like "Biological Dentists near me," and then screen a potential dentist to your satisfaction.

## Orthomolecular/Integrative Medicine

https://riordanclinic.org/

https://orthomolecular.org/

https://orthomolecular.org/resources/omns/index.shtml

https://www.icimed.com/

https://www.acimconnect.com/

https://www.acam.org/

https://www.aaosh.org/

https://aaot.us/

https://www.americancollegeofintegrativemedicineanddentistry.com/

## For High-Quality Liposome-Encapsulated Supplements

https://www.livonlabs.com/

https://www.altrient.com/

## For Other Books and Articles by Dr. Levy

https://www.tomlevymd.com/

https://www.medfoxpub.com/

Instagram

@drthomaslevy

# Index

## A


**abnormal lipid profiles** 48

**abscesses**

- focal infections 44
- in oral cavity 39
  - tonsils 65
  - tooth root tip 51, 52, 53, 54, 56, 57, 59

**ACE2 (angiotensin-converting enzyme 2) receptors**

- description and properties
  - found in or on
    - many tissues of the body 117, 118
    - most organs 161
  - function impaired by spike protein 118
  - platelet stickiness promoted by spike protein binding to 130
  - spike protein binds to 161
    - can activate blood clotting 128
    - in different areas of the body produces multiplicity of symptoms and side effects 124
    - on the endothelial cells lining lung 128
    - platelets and blood vessel walls increase chances of thrombosis 118
    - throughout body 116
  - spike protein facilitates COVID pathogen entrance into cells 155
  - strong ongoing presence of spike protein binding in people with history of acute or chronic COVID 170
- treatment protocols
  - hydroxychloroquine (HCO) and chloroquine (CO) blocks spike protein from binding to 134, 135
  - ivermectin blocks spike protein from binding to 134
  - methylene blue prevents initial binding of spike protein 364
  - quercetin blocks binding of spike protein 135

**acetaldehyde** > *See under TOXINS & POISONS, chemicals*

**acetaminophen** > *See under TOXINS & POISONS, drugs*

**adrenal glands**

- glandular recovery 270
- highest concentration of vitamin C 262
- output capacity 380, 381
- release of hormones 261, 270
  - adrenaline 260
  - cortisol 214, 217, 245, 246, 248, 254, 255, 257, 258, 259, 262

**adult respiratory distress syndrome (ARDS)** > *See under DISEASES and MEDICAL CONDITIONS (non-dental), PULMONARY DISEASES*

**alcohol** > *See under TOXINS & POISONS, drugs*

**alimentary tract** 47, 409

**all-cause mortality** 548, 549, 550, 551, 555, 556, 585, 603, 619, 621 > *See also under various nutrients, toxins, etc.*

- importance of 91

**allergic diseases** > *See under DISEASES and MEDICAL CONDITIONS*

**allergic rhinitis** > *See under DISEASES and MEDICAL CONDITIONS*

**allergies** > *See under DISEASES and MEDICAL CONDITIONS*

**aluminum** > *See under HEAVY METAL ACCUMULATION*

**Alzheimer's disease** > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*

**amalgam fillings** > *See under DENTAL PROCEDURES*

**amphetamine** > *See under TOXINS & POISONS, drugs*

**anaerobic bacteria** > *See also under pathogens, anaerobic*

**antibiotics**
- blocked by biofilms 45, 65, 396, 407
- iron-chelating properties 44, 86
- not only way to address infection 407
- related to
  - dental surgery 471, 472
  - septic shock 227, 359
  - vitamin C administration 302, 382

**antioxidants**
- deficiencies
  - mark the pathophysiology of all disease 173, 199, 207
- need to supplement with 322
- properties of
  - aid hormone uptake 242
  - anti-cancer 201
  - antitoxins 34
  - decreases increased biomolecular oxidation (IBO) 239
  - electron distributors 32, 322
  - include anti-inflammatory substances 253
  - lack of in modern food 322
  - neutralize oxidative stress 223, 224, 225, 226, 228, 230, 231, 233, 253
  - reducing agents 32
- relationship to
  - brain inflammation 345
  - cancer treatment protocols 431
  - cardio treatment protocols 423
  - intracellular GSH 238, 240, 242
  - optimal treatment protocols 373, 381, 383, 386

**antioxidants —**
*continued...*
- osteoporosis treatment protocols 448
- periodontal infections 51
- persistent spike protein (PsP) 115
- redox biology 32
- resolution of chronic diseases 208
- toxins 322
- specific antioxidants
  - CoQ10 > *See under BASELINE SUPPLEMENTS*
  - magnesium > *See under BASELINE SUPPLEMENTS*
  - methylene blue > *See under BASELINE SUPPLEMENTS*
  - methylene blue and vitamin C 353
  - niacin > *See under BASELINE SUPPLEMENTS*
  - niacin and NAD 336
  - quercetin 306
  - vitamin C > *See under BASELINE SUPPLEMENTS*
    - cannot compensate for deficiency with other antioxidants 310
  - vitamin D3 > *See under BASELINE SUPPLEMENTS*
  - vitamin E 307
  - vitamin K2 > *See under BASELINE SUPPLEMENTS*
- stabilizing a G6PD patient with 304
- used to
  - inhibit kidney stone formation 303
  - respond to pro-oxidants 260
  - treat cancer patients 348

**antiparasitic drugs** 134
- Chloroquine (CQ) 134, 135, 138, 368
- Hydroxychloroquine (HCQ) 134, 135
- ivermectin 127, 134, 135, 137, 138

**anti-pathogenic agents**
and Herxheimer-like reactions 295
hydrogen peroxide 387, 388, 393
hydrogen peroxide nebulization 398
hyperbaric oxygen therapy (HBOT) 395
leaf extracts 230
magnesium 320
optimal treatment protocols 376
ozone 392
UBI treatment 395
UV light 140
vitamin C 85, 282
vitamin C and magnesium 257
combined with DMSO 412

**antitoxins** > *See also antioxidants*
bio-oxidative therapies 377
many also have antibiotic properties 376
relationship to treatment protocols 373
specific antitoxins
leaf extracts 230
vitamin C 133
- and methylene blue 357
- biosynthesized in the liver 261
- most powerful 34, 297

**appendix** 45

**arrhythmias** > *See under DISEASES and MEDICAL CONDITIONS, CARDIOVASCULAR DISEASES*

**arsenic** > *See under HEAVY METAL ACCUMULATION*

**arthritis** > *See under DISEASES and MEDICAL CONDITIONS*

**asthma** > *See under DISEASES and MEDICAL CONDITIONS, PULMONARY DISEASES*

**atherosclerosis** > *See under DISEASES and MEDICAL CONDITIONS, CARDIOVASCULAR DISEASES*

**autism** > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*

**autoimmune disease** > *See under DISEASES and MEDICAL CONDITIONS*

## B

**bacteria**
in the microbiome 47
in the mouth 67, 185, 471
cavitations 470
on tongue covered with biofilm 409
in the walls of atherosclerotic blood vessels 186
killed by
hydrogen peroxide 384
vitamin C 281
specific bacteria
Clostridium botulinum 58
Klebsiella pneumoniae 359
testing for 476

**barbiturates** > *See under TOXINS & POISONS, drugs*

**Barnes, Broda, MD, PhD** 429

**BASELINE SUPPLEMENTS**
and all-cause mortality 425, 442, 450
coenzyme Q10 (CoQ10)
all-cause mortality 175, 176, 177, 338
deficiency 179
- relationship to increased C-reactive protein 177
history 177
properties of
- body synthesizes 179
- improves ejection fraction (EF) 177, 338
- increases cellular energy production 178
- IV infusion protects against ischemic damage 229

**Baseline Supplements —**
CoQ10 *continued...*

- part of the electron transport chain (ETC) 174, 339, 347
- promotes mitochondrial ETC 176
- reduces vascular mortality 174
- rescues those thought to have terminal heart failure 177
- supports ATP production 175, 338

relationship to
- all cardiovascular conditions 179
- cancer treatment 348
- cardiomyopathy 175
- organ tissues 175

studied extensively since 1955 177

supplementation recommendations 454

magnesium

and all-cause mortality 112, 237, 325, 326, 444

as magnesium ascorbate 285, 290

deficiencies 312, 313

list of conditions healed by 321

low intracellular levels
- and QT interval 316
- cause arrhythmias 168, 170, 173, 313, 315
- caused by chronic diuretic therapy 315
- caused by hypothyroidism 245
- cause ectopic heartbeats 313, 314, 315, 319
- cause many diseases (list of) 311
- cause of many diseases 310
- fuel many diseases (list of) 312
- only corrected by magnesium ingestion 310
- promote kidney stones 303
- suppresses ATP production 173

**Baseline Supplements —**
magnesium *continued...*

properties of
- 99% located inside cells 310
- calcium channel blocker 78, 112, 136, 237, 257, 309, 311
- cellular concentrations inversely proportional to calcium 237
- concentrated in monocytes 188, 257, 324, 378
- conserved by insulin 249
- fourth most common cation in the body 310
- increases testosterone levels 244
- leading player in the electrical stability of heart and nerve cells 319
- levels conserved by estrogen 242
- lowers inflammation 257
- maintains ATP levels 240
- most critical nutrient/electrolyte 237
- prevents kidney stones 269
- reduces oxidative stress 188, 249, 320
- shortens prolonged QT intervals 319

relationship to
- insulin and insulin resistance 244, 249
- intracellular GSH 238
- thyroid hormone 245

supplementation recommendations 237, 453
- 326, 333
- as part of Super 8 - dosage recommendation 453
- in osteoporosis treatment protocols 442, 448
- most people are deficient 310
- optimal treatment protocols 376, 383
- optimizing levels 322

testing for

**Baseline Supplements —**
magnesium *continued...*

- determine with sublingual epithelial cell magnesium assay 323

toxicity considerations 332

types

- lyposome-encapsulated 325

used with/as

- cancer treatment protocols 439
- cardiac treatment protocols 423, 424
- chronic pathogen colonization (CPC) treatment protocols 412, 418
- diabetes mellitus management 213
- ectopic heartbeats treatment 166
- part of mop-up C protocol 294
- seizure therapy 319, 320
- sepsis treatment 268
- toxin overdose treatment 358

methylene blue

contraindications

- G6PD-deficient patients 305

properties of

- able to easily cross the blood-brain barrier 355
- aids in production of ATP 347
- antipathogenic 69
- antiviral 366
- clinical impact similar to vitamin C 226
- highly effective antioxidant 351, 353, 354, 356, 357, 363, 365, 368
- highly effective in resolving oxidative stress 228
- powerful clinical impact 354

supplementation recommendations 454

- for treating infected tonsils 69

used to treat 367

- dementia 439
- infections 355

**Baseline Supplements —**
methylene blue *continued...*

- list of conditions from PubMed 366
- neurodegenerative diseases 180
- septic shock 361
- tonsillar CPC 414
- vasoplegia 362

niacin/niacinamide (vitamin B3)

and all-cause mortality 219, 338

deficiency

- part of schizophrenia pathology 179, 345
- pellagra 179, 338, 342
- produces neurocognitive symptoms 340

nomenclature and physiology 333

properties of

- binds lipoproteins 192
- boosts bodywide ATP production 334, 347
- boosts NAD levels 179, 218, 346
- eating niacin-containing foods lowers the statistical risk of developing Parkinson's disease 341
- increases NAD blood levels 338
- lessens abnormal lipid parameters 335
- optimizes production of NAD for ATP synthesis 334
- pellagrra-preventative (vitamin PP) 333
- promotes mitochondrial ATP production 137

relationship to

- central nervous system 329

side effects 330

supplementation recommendations

- as one supplement of Super 8 453, 454
- list of forms 335

**Baseline Supplements —**
niacin/niacinamide *continued...*

- no contraindications 349
- often underdosed 330
- optimal energy-supporting dose 335

used to treat

- ANY psychological, behavioral, and/or psychiatric condition 348
- brain dysfunction 342
- high doses often resolve schizophrenia 345, 347, 348
- improves antioxidant status of cancer patients 348
- improves cardiovascular conditions 179
- lessens symptoms of Alzheimer's disease and Parkinson's disease 341
- reduces damage from myocardial infarction 337
- schizophrenia 336, 342
- supports recovery from sepsis 340

vitamers 333, 334

- inositol hexaniacinate 335
- inositol hexanicotinate 335
- niacinamide 74, 137, 179, 192, 218, 334, 335, 336, 337, 338, 339, 340, 345, 346, 347, 348, 425, 439, 454
- nicotinamide 218, 335
- nicotinamide mononucleotide 334
- Nicotinamide mononucleotide 335
- nicotinamide riboside 334, 335
- nicotinamide (same as niacinamide) 174, 179, 334
- nicotinic acid amide (same as niacinamide) 334

riboflavin (vitamin B2)

properties of

- supports ATP production 137, 180, 347

supplementation recommendations 454

**Baseline Supplements —**
riboflavin *continued...*

used in treatment of

- breast cancer 348

used to treat

- heart failure and cardiac metabolism 180

vitamin C > *See also under BIO-OXIDATIVE THERAPIES*

and all-cause mortality 112, 136, 444

as bio-oxidative therapy 135

clinical factors

- administration duration 289
- administration frequency 289
- administration rate 287, 288
- administration route 284, 285
- dose 283
- forms of 290, 292
- multi-C protocol 293
- synergistic therapies 292

contraindications and considerations

- G6PD deficiency 304, 305
- kidney stones 300, 302, 303

deficiencies 184, 352

- and heart failure 173
- atherosclerosis 190, 191, 192, 193, 194
- equal inflammation 252
- focal scurvy 184, 189, 190

history 26, 277, 278

optimizing the immune system 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 267, 268, 269, 271

properties of

- anti-pathogenic 279, 280, 281
- antitoxin 282, 283
- increases electron flow 223, 224, 225, 226, 228, 231
- modulates intracellular oxidative stress 235
- neutralizes toxins 281
- RDA 331

**Baseline Supplements —**
vitamin C *continued...*

- safety 298, 300, 330
- superior antioxidant 275
- supreme antioxidant 275
- the real anti-inflammatory 246
- unique properties 276
- uptake facilitated by magnesium 320

relationship to

- ATP stores 239
- cancer 200, 201
- central nervous system 329, 331, 332, 334, 345
- chronic pathogen colonizations (CPC) 187, 188
- copper deficiency 89, 92
- cortisol 247, 248, 253, 254, 255, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268
- cortisol (safety) 269
- diabetes 211, 212, 214, 215, 216, 217, 218, 219
- estrogen 242
- Fenton reaction 86, 89
- fibroblasts 191
- focal inflammation 256
- GSH levels 238
- hormone replacement therapy 241, 242, 243
- immune system 183
- immunosuppressive drugs 306, 308
- inflammation 345
- insulin 249
- intracellular activity 237
- kidney stones 300
- methylene blue 352, 353, 354, 357, 358
- methylene blue (safety) 271, 361, 368
- monocytes 188
- ORAC test 232
- osteoporosis 331, 443, 444, 448, 450

**Baseline Supplements —**
vitamin C *continued...*

- persistent spike protein (PSP) 128, 132, 133, 134, 137, 138
- QT prolongation 320

research discoveries 278, 279, 280, 281, 282

supplementation recommendations 378, 379, 453, 454

- nebulizing 127

treatment protocols

- bio-oxidative therapy 377
- cardio 425, 426, 427, 428, 434
- chronic pathogen colonization (CPC) 412, 418
- clinical applications 382, 383
- diabetes/dementia 437, 438, 439
- mop-up IVC 295, 297, 298
- optimal 376, 377, 378, 380, 381, 382, 387
- osteoporosis 442
- persistent spike protein (PSP) 400

types

- ascorbic acid 294
- asorbyl palmitate 294
- lyposome-encapsulated 134, 137, 282, 284, 285, 286, 294, 380
- natural 292
- sodium ascorbate 137, 138, 284, 290, 291, 294, 327, 380, 412, 424
- vitamin C complex 292

vitamin D3

and all-cause mortality 112, 442, 445

contraindications

- with calcium supplementation, increases risk of kidney stones 449

optimal osteoporosis treatment protocols 441, 442, 448, 449, 450

**Baseline Supplements —**
vitamin D3 *continued...*
properties of
- helps dissolve kidney stones 269
- improves bone quality 112
- lessens ischemic brain damage 225
supplementation recommendations 424, 453
- as part of Super 8 protocol 137
vitamin K2
and all-cause mortality 112, 442, 445
part of osteoporosis treatment protocols 448, 450
properties of
- helps to prevent kidney stones 269
- reduces oxidative stress 229
supplementation recommendations 453
- as part of Super 8 137, 453
- recommendation 424
- toxicity extremely difficult to achieve 74

**benzene** > *See under TOXINS & POISONS, chemicals*

**biofilms**
composition 45
on chronically infected tonsils 65
overlaying pathogens 65, 104
overlying CPCs 45, 406
relationship to antibiotics 407
stripping away 327, 396, 411, 412

**biomolecules**
examples of 198
impact of
antioxidants 32, 223, 224, 356, 357, 370
- vitamin C 33
excess calcium 236

**biomolecules —**
impact of *continued...*
hydrogen peroxide 265
oxidation 30, 34, 198, 223, 356
- pathology of disease 37, 38, 102, 199, 337, 403, 404
oxidized biomolecule accumulation 38, 84, 198
pathogens 43
reduction versus oxidation 29, 30, 32, 198, 199
toxins 31, 37, 40, 211, 356, 433
redox reactions inside 253
repairing/restoring 38, 40, 42, 115, 337, 376, 405, 432

**BIO-OXIDATIVE THERAPIES**
description and properties 376, 433
mechanism of impact 395
hydrogen peroxide (HP)
description and properties
- anti-pathogenic 384
- anti-pathogenic and effective disinfectant 384, 385
- bio-oxidative therapy 127, 135, 283, 373, 400
- breaks down into water and oxygen 392
- central regulating molecule 385, 386
- effective storage form of oxygen 387
- eradicates pathogens contracted through respiration 87, 390, 391
- essential signaling molecule 388
- ideal agent for eradicating infections and promoting healing 391, 392
- important for optimal health 385
- kills all pathogens 384, 387, 389
- lessens leaky gut and abnormal microbiomes 392
- monionic molecule 386

**Bio-Oxidative Therapies —**
description/properties *continued...*

- natural antibiotic 385, 387
- non-toxic 385
- part of the Fenton reaction 86, 264, 387
- present everywhere in the body 386
- protects body against infection 389
- "standby" ability 386
- strips away biofilms 412
- triggers responses, limits or repair oxidative damage 386
- with ozone 393
- works synergistically with vitamin C 133, 188, 377, 378

direct ingestion
- oxidizes pathogens and infected host cells 377

intravenous administration 392
- as powerful anti-viral therapy 378

mouthwash 410, 418
- prevents COVID-19 infections 390

nebulization 387
- and mainstream acceptance 391
- and the spike protein 127
- and vitamin C supplementation 138
- augments body's natural expression of HP to fight pathogens 388
- compatibility with other therapies 390
- eradicates pathogens contracted through respiration 137, 390
- guidelines 369, 398, 399, 412
- increases blood oxygen 388
- only "toxic" effects 389
- safety 390, 399
- should be part of treatment protocol for any condition 374

**Bio-Oxidative Therapies —**
nebulization *continued...*

- successfully treats COVID-19 133, 141, 389
- to eliminate chronic pathogen colonization (CPC) in oral cavity 327, 373, 378, 438

opposed by traditional medicine 385

produced by/in
- extracellular spaces by vitamin C 387
- human body 385, 386, 388
- human body - increased by infection and inflammation 387
- human body - increased by pulmonary infection 392
- human body - increased by ultraviolet blood irradiation (UB) 395
- human body - monocytes 188, 257, 378
- human body - phagocytes 378, 387
- human body - pulmonary epithelial cells 388
- nature 388

hyperbaric oxygen therapy (HBOT)
description and properties 377, 395
- synergistic effect with vitamin C 284

treatment protocols
- cancer 434
- persistent spike protein (PSP) syndrome 135, 401

list of 135, 377

ozone
description and properties 135, 293, 392
- anti-pathogenic 393

treatment protocols
- cancer 393
- chronic pathogen colonization (CPC) 69
- COVID infections 393
- dental extractions 417, 435

**Bio-Oxidative Therapies —**
ozone *continued...*
- dental surgery 471
- persistent spike protein (PSP) syndrome 394, 400
- root canal-treated teeth 59
- Rouleaux formation 132
- tonsillar infection 69
- tonsillar infections 414

treatment protocols 127, 283, 373, 400, 401
cancer 434
chronic pathogen colonization (CPC) 439
limb-threatening infections 395
ultraviolet blood irradiation (UBI)
description and properties 377, 394
- anti-pathogenic 395
- inactivates the SARS-CoV-2 virus 140
- therapeutic agent 135
- treatment protocol for persistent spike protein syndrome 401

treatment protocols
- cancer 434
- persistent spike protein (PSP) syndrome 136, 400
- simple cure for COVID? 138, 139, 140

vitamin C (VC)
description and properties
- regarding Fenton reaction 377, 378

treatment protocols 382
- acute infections and/or toxic challenges 380
- infections and chronic diseases 381

**biopsy** 58, 68, 152, 179, 323, 420
**bipolar disorder** > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*

**bladder**
cancer > *See under DISEASES and MEDICAL CONDITIONS, cancer*
focal infections 45
stones 302

**bone density** > *See also under Diagnostic Tests*
related to tooth extraction sites 54

**brain**
energy metabolism in 218
impact of
COVID proteins 115
heavy metal accumulation 46
methylene blue 180
niacin deficiency 179
pathogens in (related to various diseases) 206
persistent spike protein 121
need for ATP 339
orthomolecular treatments
estrogen 242
insulin 288
methylene blue 355, 357
niacin, CoQ10, and riboflavin 347
niacin/niacinamide/vitamers 339, 347, 348
vitamin C 225, 354
pathology
abscesses > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*
diabetes & dementia 213, 437
injury
- and ceruloplasmin 91

related to niacin deficiency 342, 343
schizophrenia 341, 343, 344, 345, 346, 347

**brain abscess** > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*

## C

**CAC score** > *See under Diagnostic Tests*

**cadmium** > *See under HEAVY METAL ACCUMULATION*

**calcium channel blockers**
- and all-cause mortality 63, 76, 78
- cortisool/hydrocortisone 248, 254
- estrogen 75
- magnesium 78, 237, 311, 444
- prescription (hypertensives) 76, 78, 319, 362
- sex hormones 82, 243, 445

**cancer** > *See under DISEASES and MEDICAL CONDITIONS*

**Cancer** > *See Cancer Diagnosis/ Treatment*

**Cancer Diagnosis/Treatment** > *See Cancer*

**CAP** > *See under DENTAL DISEASES, periodontitis, chronic apical periodontitis*

**carbon monoxide** > *See under TOXINS & POISONS*

**cardiovascular disease** > *See under DISEASES and MEDICAL CONDITIONS, CARDIOVASCULAR DISEASES*

**Cathcart, Dr. Robert** 91

**cavitations (cavitational osteonecrosis)** > *See under DENTAL INFECTIONS and CONDITIONS, cavitational osteonecrosis*

**cell membranes**
- protected by vitamin E 276
- regulate electrolyte solute and nutrient transport 33
- spike protein attaches to 115, 117

**cell membranes —** *continued...*
- transport across facilitated by
  - cortisol 255
  - liposome encapsulation 286
- voltages across 33

**chelation** > *See under HEAVY METAL ACCUMULATION*

**chemotherapy**
- impact on immune system 434
- pro-oxidant nature of 215, 293
- relationship to
  - Fenton reaction 91
  - heart failure 155
  - mucositis 48
  - oxidative stress 77
- used in conjunction with
  - chelation therapy 155
  - insulin potentiation therapy (IPT) 288
  - vitamin C 293
- versus
  - bio-oxidative therapies 433
  - methylene blue 366

**chickenpox** > *See under DISEASES and MEDICAL CONDITIONS*

**Chloroquine (CQ)** > *See under antiparasitics*

**chromium** > *See under HEAVY METAL ACCUMULATION*

**CHRONIC PATHOGEN COLONIZATION (CPC)**
- list of disease-causing impacts of CPCs 206
- locations
  - in the oral cavity 36, 49
    - list of common 413
    - tonsils 65
  - throughout the body 36

**CPC —**
pathogens *continued...*

pathogens
oral
- continually swallowed, contribute to gut problems and chronic disease 45
slow rate of growth 45
properties of
1 of 3 primary toxin sources 39
antibiotic resistant 407
cause and sustain nearly all chronic disease 436
characterized by overall lower concentration of pathogens 45
generally asymptomatic infections 45
generally covered by biofilms 45
likely present in all chronically diseased tissues 45
most clinically significant source of consequential toxins 432
seed disease and infection 106
- coronary arteries 426, 427, 428
relationship to
abnormal gut microbiome 404, 405
cancer 197, 206, 208, 209
coronary artery disease 186, 187, 188, 192, 193
COVID 126, 396, 397
treatment protocols
bio-oxidative therapies 439
cancer
- diagnose and treat all focal infections and CPCs 434
HP nebulization 327, 373
hydrogen peroxide nebulization 133, 378, 388, 400, 438
nebulizing 411
optimal 403, 408, 410, 414, 415, 418

**clinical impact/response**
cavitation infections 62
equal impact from reduced and oxidized antioxidants 225
impacts on
oxin exposure 38
toxin exposure 39
lessening impact 39
need to quell inflammation to achieve positive response 219
negative impact of toxins 33
responses to
bio-oxidative therapy responses to PSP and COVID 136
hydrogen peroxide (HP) nebulization 390
magnesium 309, 310, 323
- against insulin resistance 439
- given intravenously 325
methylene blue 357
- comparable to impact of vitamin C 226, 353, 354
niacin
- against schizophrenia 347
vitamin C 232, 284
- against polio 321
- against tuberculosis 281
- impact greater than antioxidants with higher ORAC score 231
- list of factors that influence 283

**Clostridium tetani bacteria** 41
**cocaine** > *See under TOXINS & POISONS, drugs*
**complications of pregnancy** 48
**computed tomography** > *See under Dental Procedures*
**cone beam computed tomography (CBCT)** > *See under DIAGNOSTIC TESTS, X-Ray*
**COPD** > *See Pulmonary Disease (COPD); See under chronic obstructive pulmonary disease*

**copper** > *See under HEAVY METAL ACCUMULATION*
**CoQ10** > *See under BASELINE SUPPLEMENTS*
**coronary arteries**
blockages may not be cause of heart failure 146
menopause promotes higher calcium scores 75

**cortisol** > *See under Hormones*
**cortisol receptors** > *See under HORMONES*
**Corynebacterium diphtheriae** 41
**COVID** > *See under DISEASES and MEDICAL CONDITIONS*
**COVID vaccination** 126, 132, 140, 141, 172
booster shots 114, 125, 126, 132, 140, 141, 172, 318

**Crohn's disease** > *See under DISEASES and MEDICAL CONDITIONS*
**crown** > *See under Dental Structures*
**cyanide** > *See under TOXINS & POISONS, chemicals*
**cytoplasm**
caintains 1/10 ATP as found in the mitochondria 240
concentration of vitamin C reflects ultimate health 273
dysfunction within stems from increased number of inactivated biomolecules 337
exosomes
deliver spike protein into 120
deliver their contents into 119
induced to be released from 120
insulin potentiation therapy enhances uptake of extracellular agents into 288
of monocytes
concentrate 80-fold more vitamin C 256
removal of calcium from 78

**cytoplasm —**
*continued...*
unique qualities of MB facilitate entrance into 357

## D

**D-dimer** > *See under DIAGNOSTIC TESTS*
**deficiencies**
all diseases accompanied by 375
clinical improvement of 352
copper caused by high-dose vitamin C 92
genetic 336
hormone 36, 37, 46, 71, 244, 250, 376, 434
thyroid 244
important natural substances 352
iron 97
magnesium > *See under BASELINE SUPPLEMENTS, magnesium*
magnesium and potassium 326
limits effectiveness of arrhythmia treatments 326
NAD 334
nutrient 111, 340, 348, 375
vitamin C > *See under BASELINE SUPPLEMENTS, vitamin C*

**dehydroascorbic acid (DHAA)**
ascorbic acid and kidney stones 301, 302
presence in blood indicator of increased oxidative stress 354
properties of
as effective as reduced vitamin C 223, 225
maybe more effective in brain and nervous system 225
minimizes brain infarct and reverses brain ischemia 354
oxidized form of vitamin C 226, 275, 277

**DHAA —**
properties of *continued...*

quickly converts to reduced vitamin C in the bloodstream 224

**dementia** > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*

**Dementia** > *See Alzheimer's Disease*

**DENTAL INFECTIONS and CONDITIONS**

abscessed/infected teeth > *See DENTAL INFECTIONS and CONDITIONS, root canal-treated*

biodentistry approach to 417, 418

diagnosing 57

- asymptomatic 196, 204, 210, 435

extraction protocol 469

- cannot be adequately cleaned with laser 60
- expected to improve general health 63
- importance of extracting all 435
- requires proper socket cleaning 63

impact of

- chronic pathogen colonization (CPC) 44, 206, 426, 432
- huge negative health consquences 51, 52, 54
- seed focal infections 68, 204, 209

linked to

- cancer 435, 436
- chronic disease 52, 53, 54, 58
- heart attack 204
- infected tonsils 68, 69

prevalence of 55

cavitational osteonecrosis (cavitations)

and all-cause mortality 62

definition/description 60, 62

- pathophysiology 55, 58

**Dental Infections and Conditions —**
cavitations *continued...*

impact of

- as health-destroying as abscessed teeth 54
- feed tonsillar infections 68
- focal infections 45
- foci of CPC 404, 415
- NICO (neuralgia-inducing cavitational osteonecrosis 62
- often behind medical problems 63
- size major determinant of health 62
- story of impact 64

importance of examining for 54, 418

- as part of breast cancer treatment protocols 438
- as part of heart disease treatment protocol 429

surgical protocol 64, 469, 470, 471, 473, 474, 476

toxin profiles 58

chronic gum infection 49

dental infections 54, 64

edentulism 62

all-cause mortality 62, 63

gingivitis 49, 54, 64

periodontal disease

pathogens related to tongue coatings 410

periodontal infection 45 > *See also DENTAL INFECTIONS and CONDITIONS, periodontitis*

cause-and-effect link to breast cancer 203

linked to chronic disease 51

periodontitis

bacteria - different kinds 56

chronic apical periodontitis (CAP) 45, 52, 53, 55, 57, 413, 417, 469, 471, 473

pathogen profile of 51

relationship to

**Dental Infections and Conditions —**
periodontitis *continued...*

- abnormal gut microbiome 49
- chronic disease 49, 52, 203
- chronic disease (list of) 50
- dental hygiene 411

seeds other areas of body with pathogens 206

source of
- pathogens 432

toxicity of 415

root canal-treated

impact of > *See also DENTAL INFECTIONS and CONDITIONS, abscessed/infected teeth*
- bacterial infection 53
- no protection against new infections 60

prevalence of 55

**DENTAL PROCEDURES**

amalgam dental fillings 420

cavitation remediation 65

debridement 55, 62, 65, 469, 474, 475, 476

debride 55, 65

debulking

debulked 57

dental evaluation 54, 470

dental examination 54, 470

dental laser 60

nucleotide photoaffinity labeling 57

tooth extraction

creation of cavitation if not done properly 60

need for proper protocol 470

of root canal-treated tooth 58

proper cleaning of socket to remove infection 63

rather than root canal 416

surgical protocol 473, 474, 476

use of ozone 417, 418

**Dental Procedures —**
tooth extraction *continued...*

tooth sterilizing 60

tooth sterilization 60

X-ray > *See under DIAGNOSTIC TESTS*

**DENTAL STRUCTURES**

connective tissue 56, 59, 191, 192, 193

dentinal tubules 56, 60

gums

and chronic pathogen colonization (CPC) 400, 427

infected compared to infected teeth 51

site of focal infection 45, 49, 63, 68, 404, 438
- and lymphatic flow 68, 203
- in children 54
- often present with coinfections of teeth, cavitations, and sinuses 429
- relationship to tonsils 69, 418

jawbone

and root canal treatment 56

lymphatic drainage of 68

post-surgical infection in 469

post tooth extraction
- failure to remove periodontal ligament 470

site of cavitation 60, 61, 64, 470
- often escape X-ray detection 470

site of focal infection 51
- relationship to tonsils 68

surgical cleaning of 65, 470, 473, 474

periodontal ligament

failure to remove after tooth extraction 60, 417, 470

need to clompetely remove during tooth extraction 417

pulp

anatomical description 56

**Dental Structures —**
pulp *continued...*

inability to sterilize 60
removal during root canal treatment 56, 59
site of focal infection 53, 56, 59
vitality tests 470, 471
root tips
site of infection (chronic apical periodontitis) 51, 52, 53
- content released to 51
- detection with X-ray 51, 54, 57
- variety of pathogens 56
site of infection in root canal-treated teeth 57, 59
- in root canal-treated teeth 56
socket
cleaning after tooth extraction 474
during tooth extraction
- "expand" or "crack" 474
need to clean after tooth extraction 55, 63, 417, 470
- use of insulin 418
- use of ozone 417

**dentin** > *See under Dental Structures*

**dentists**
are oral bone surgeons 469
biological 61, 416, 417, 471
endodontists 59
traditional 59, 61, 436, 469
traditional dentists 59, 61, 416, 417, 436, 469, 471

**depression** > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*

**diabetes** > *See under DISEASES and MEDICAL CONDITIONS*

**DIAGNOSTIC TESTS**
bone density 54, 64, 80, 444
CAC score 81
all-cause mortality 81

**Diagnostic Tests —**
*continued...*

D-dimer 122, 128, 129, 130, 132, 139, 140, 141, 142, 167, 170, 171, 172, 400, 401
ejection fraction (EF) 145, 149, 154, 176, 177
electrocardiogram (ECG) 157, 164, 167, 168, 169, 170, 327
ferritin blood test
blood donation can lower levels and reduce risk of myocardial infarction 95
criteria for determining when to supplement with iron 99
inflammation marker 76, 93, 94, 95, 96, 150
levels: elevated 150
- all-cause mortality 96
- an inflammation marker 93
- associated with coronary artery disease 95
- by severe infections 93
- in cancer patients 96
- indicated increased stores of iron in the body 93
- indicates increased oxidative stress 94
- linked to coronary artery disease 95
- loss of arterial dilation ease 95
- most adults have 150
levels: low 94, 99
- should never be considered too low 88
levels: what they indicate 93
- excess iron in the body 93
- reliably reflects excess bodily iron 93
reading results
- LabCorp reference range 94
- reference range (dangerous) 95
- target range 95
- true normal 94
reference range

**Diagnostic Tests —**
ferritin blood tests *continued...*
- dangerous 95
glucose
need for baseline 132
interleukin-6
for inflammation 172
oxidative balance score (OBS) 303
pulp vitality 470, 471
RBC magnesium
reference range 324
sublingual epithelial cell magnesium assay 323
troponin level blood test 157, 158, 159, 160, 161, 162, 171, 400, 401
all pilots should be routinely tested 167
X-ray
cone-beam computed tomography
- biological dentist expertise needed for reading 414
- detecting oral cavity infections 429
- detecting root tip pathology 196
- essential in initial evaluation of all dental patients 417, 429
- for breast cancer patients 209, 435
- mandatory for those with chronic disease 54
- sometimes miss cavitations 63
detecting cavitations 65
detecting root tip pathology 57, 59
detecting upper respiratory infection 157
hypertension (high blood pressure) 51
traditional
- detecting cavitations 470

**diet**
as source of new electrons 224, 353
need for
balanced 224, 340, 448
gluten-free 105, 106
good 111
healthy 98
nutrient-rich 37, 71, 108, 109
organic 111, 322
poor 215
related to
calcium 75, 79, 83, 445, 447, 448
glucose control 438
hydrogen peroxide 388
iron 96, 98, 405
perfect 109
total food pulverization (TFP) 111
vitamin C 226, 331
vitamins and minerals 347

**Dietary toxin exposures** 36
**diphtheria** > *See under DISEASES and MEDICAL CONDITIONS*
**DISEASES and MEDICAL CONDITIONS (non-dental)**
Abnormal lipid metabolism 312
allergies
food allergies 48, 103
linked to enriched foods 104
linked to incompletely digested foods 103
linked to leaky gut 98, 406
linked to periodontitis pathogens 48
anemia
can be caused by periodontitis pathogens 50
copper deficiency 88
hemolytic 125, 304, 368
hypochromic, microcytic 99
iron

**Diseases and Medical Conditions —**
anemia *continued...*

- not present if normal hemoglobin 94
iron deficiency 44, 88, 94, 99
sickle cell 150
arthritis
and CPC 207
caused by iron toxicity 103
linked to abnormal microbiome 48, 49
linked to periodontitis pathogens 50
responsive to UBI treatment 395
autoimmune disease
linked to abnormal microbiome 48
linked to periodontitis 53
linked to periodontitis pathogens 51
thyroid
- linked to abnormal microbiome 48
bacterial vaginosis
linked to abnormal microbiome 48
cancer
always initiated in inflamed tissue 200
chemotherapy 155, 215
kinds of
- bladder 91
- blood 50
- breast 48, 198, 203, 206, 208, 209, 436
- colorectal 48, 50, 198, 203, 206, 208, 209, 436
- esophageal 50
- gastrointestinal tract 99
- leukemia 54
- liver 50, 101
- lung 50
- pancreatic 48, 50, 198, 203, 206, 208, 209, 436

**Diseases and Medical Conditions —**
cancer *continued...*

- skin 50
- stomach 50
linked to
- abnormal microbiome 48
- calcium intake 81
- chronically infected tonsils 67
- chronic toxic exposures 198
- CPCs and focal infections 197
- “dead teeth” 67
- high calcium intake 75, 77
- high copper blood levels 90, 91, 149, 155
- high iron, copper, and calcium blood levels 96
- list of oral CPC infections 413
- low levels of NAD and ATP 338
- magnesium deficiencies 312
- parasites 43
- periodontitis pathogens 50
- toxins 197
marked by
- increased systemic oxidative stress 131
mortality rates related to vitamin C blood levels 298
multifactorial Cancer Risk Score evaluation 282
of the breast 54, 58, 64, 80, 197, 198, 199, 200, 203, 204, 205, 208, 209, 230, 348, 413, 435, 436
- and CPCs 206, 207
- and high intracellular calcium levels 82
- cause-and-effect relationship with periodontal infection 203, 204
- inhibited by tewa plant 230
- in women most common cancer 198
- linked to cavitational osteonecrosis 58, 64
- linked to high calcium intake 80

**Diseases and Medical Conditions —** cancer *continued...*

- linked to tonsillar infections 209
- morbidity and mortality 198
- pathophysiology 200, 201
- some researchers consider an infectious disease 205
- usually originates from a focus of infection 197

relationship to

- D-dimer test 129
- Fenton reaction 85
- immune response 257
- intracellular biomolecule oxidation (IBO) 236
- muscle wasting 216
- phlebotomy 96

treatment protocols

- chelation therapies 44
- hydrogen peroxide 393
- insulin potentiation therapy (IPT) 288
- intravenous vitamin C 194
- IPT with vitamin C 289
- methylene blue 365, 366, 367
- nutrient triad 348
- optimal 431, 433, 434, 435
- should get CBCT examination 54
- vitamin C 289, 299, 381, 384
- vitamin C and chemotherapy 293
- vitamin C and die-off reactions 296
- vitamin C and Herxheimer reactions 297
- vitamin C infusions 270

CARDIOVASCULAR DISEASES

abnormal lipid and cholesterol metabolism 48, 103

all-cause mortality 50

arrhythmias 40, 121, 162, 163, 164, 168, 170, 172, 312, 313, 314, 315, 316, 317, 320, 325, 326, 328, 358, 458, 463

arterial calcification 48, 103

**Diseases and Medical Conditions —** Cardiovascular Diseases *continued...*

atherosclerosis 31, 48, 50, 95, 103, 148, 162, 178, 186, 187, 189, 190, 191, 193, 194, 196, 216, 312, 335, 337, 426, 427, 428, 429

cardiomyopathy 151, 152, 153, 154, 163, 168, 175, 176, 177, 178, 179, 180, 181, 337, 338, 339, 419, 420, 421, 422, 423, 425

- congestive 145, 146, 150
- congestive initiated by iron 149
- excess copper initiates 148
- hypertrophic 145, 146, 148
- improved with penicillamine chelation 149
- iron chelation and phlebotomy extend life 150
- iron overload 150
- microscopic study of biopsies 147
- most critical considerations 143
- no single treatment protocol 144
- rapid development of congestive 122
- toxins cause both forms 145

coronary artery disease 79, 80, 81, 95, 167, 192, 207, 426

- pathology of 193

ectopic beats 166, 169, 314, 315, 325

ectopy, atrial 313

ectopy, ventricular 313

heart disease 31, 54, 63, 75, 81, 84, 94, 95, 169, 175, 183, 184, 185, 196, 204, 207, 216, 298, 339, 428, 436, 446

- mortality 312

heart failure

- and ATP deficiency 173
- associated with abnormal microbiome 48
- associated with excess copper 91

**Diseases and Medical Conditions —**
Cardiovascular Diseases *continued...*

- associated with periodontal pathogens 50
- associated with tooth loss 63
- general heart assessment 143

hypertension (high blood pressure) 48, 76, 78, 125, 148, 178, 204, 216, 290, 312, 428

idiopathic dilated cardiomyopathy (IDCM) 151, 420

Idiopathic pulmonary fibrosis 49

ischemic stroke 63, 321, 354

myocardial infarction 48, 103

myocarditis

- and death of heart muscle 344
- clinical description 158
- diagnosing 146, 157
- high traponin levels after resolution 157
- linked to heart inflammation 146
- related to ATP production 145
- related to heavy metal accumulation 148, 152
- related to spike protein 121, 125, 156, 162, 163, 164, 167, 169, 318
- unrelated to spike protein 157, 171

peripheral vascular disease 63

Platelet aggregation 312

torsade de pointes 316, 326

vascular disease 48, 50, 103

ventricular tachycardia 314, 316, 326

chickenpox 41, 280

chronic fatigue 312

chronic pathogen colonization > *See CHRONIC PATHOGEN COLONIZATION (CPC)*

COVID-19 infections and vaccinations

claimed goal of vaccine 119

**Diseases and Medical Conditions —**
COVID-19 infections *continued...*

diagnosing blood clots with D-dimer test 128, 129, 171, 172

infection relationship to chronic pathogen colonization 407

multisystem inflammatory syndrome 164

persistent spike protein 125

- expected to continue after pandemic 422
- linked to inability to completely resolve COVID infections 124
- prevalence increasing while infections declining 116
- sudden death 121
- treatment protocols 127, 400

related to

- chronic pathogen colonization (CPC) 396
- D-dimer testing 170
- diagnosing heart damage with troponin test 157, 158
- elevated D-dimer levels 130, 132
- ferritin levels 93
- heart damage 147
- microthrombi 129, 130
- myocarditis 163
- oxidative stress 115
- PR interval prolongation 165
- root canal-treated teeth 53
- Rouleaux formation 131, 132
- sudden death 316
- systemic inflammation 64

spike protein 39

- attracted to ACE2 receptors 117, 118, 127
- attracted to heart muscle 161
- contained in exosomes 120
- different degrees of infiltration 126
- encapsulated in exosomes 121
- enveloped in exosomes 119
- found in the brain 115

**Diseases and Medical Conditions —** COVID-19 infections *continued...*

- free unencapsulated 120
- list of places found 126
- physiology 115
- prevalence 116
- related to heart damage 155, 162
- related to heavy metal accumulation 317
- related to mycarditis 318
- related to myocarditis 156
- related to pilots 167
- related to sudden death 167
- self-replicating 121
- unexpected toxin 113, 114, 116, 141, 432
- why it persists 122, 123, 432

therapeutic agents

- bio-oxidative therapies 141
- hydrogen peroxide 389, 390
- inhalation medicine 396
- list of 133, 134, 135
- methylene blue 226, 353, 355, 363, 365, 369
- methylene blue and photodynamic therapy 364
- nebulization 413
- nebulizing 398
- niacinamide 340
- ozone 140, 393, 394
- ultraviolet blood irradiation 394
- vitamin C 300, 377

treatment protocols 137

- a simple cure? 138
- hydrogen peroxide and vitamin C 138
- related to cardiomyopathy and spike protein 419
- UV light irradiation 138, 139

vaccination

- self-replication of spike protein even after infection 432
- side effects 114

vaccine 160

**Diseases and Medical Conditions —** *continued...*

COVID-19 pandemic 115, 390

Crohn's disease (inflammatory bowel disease 48, 50, 53

diabetes

associated with

- abnormal microbiome 48
- epigenetic defect 216
- low levels of CoQ10 178
- magnesium deficiencies 312
- periodontitis 53
- persistent spike protein syndrome 125
- toxins 211

pathophysiology 213

treatment protocols

- optimal 437

eclampsia 91, 311

encephalitis 343

endothelial dysfunction 312

Epstein-Barr 53

erectile dysfunction 48, 103

female infertility 50

glucose-6-phosphate dehydrogenase (G6PD) deficiency 304, 368

glucose intolerance 215, 312

hemochromatosis 95, 100, 101, 150

Herxheimer reaction 295, 296, 297, 384

inflammation

and vitamin C

- delivered by monocytes 256
- levels must be restored to alleviate 246
- magnesium, and hydrogen peroxide delivered by immune cells 257
- normalizes 248, 255
- plus steroids 307
- uptake enhanced by cortisol 247, 253, 255

**Diseases and Medical Conditions —**
inflammation *continued...*

characteristic of
- all disease 184, 442
- chronic atherosclerosis 194

DHAA
- normalizes 226

immune response
- phagocytes deliver hydrogen peroxide 387

impacts
- cardiac conduction cells 169

impairs
- ATP production 218
- lymphatic movement 202

instigated by
- ferric chloride in the gut 103
- heavy metal accumulation 422
- increased oxidative stress 130, 131, 145
- oxidative stress 256
- pathogens 257
- pellagra 338
- periodontitis 49, 51, 52, 53
- spike protein 160, 161, 163, 164, 419
- tonsillar infection 68, 70
- toxins 201, 317

marked by
- increased ferritin levels 93
- PR interval prolongation after COVID vaccination 165

measured by
- C-reactive protein and interleukin-6 tests 172
- oxidative balance score (OBS) 303

need to quell wherever it occurs 219

purpose of immune system is to reduce 252

related to
- acute infections 93
- atherosclerosis 194
- catastrophic arrhythmia 168

**Diseases and Medical Conditions —**
inflammation *continued...*

- cavitational osteonecrosis 64
- coronary artery disease 184
- kidney stones 303
- myocarditis 145, 146, 156, 157, 158, 161, 163
- osteoporotic fractures in women 442
- oxidative stress 252
- pathogens and chronic pathogen colonization 206, 207
- schizophrenia 341, 343, 344, 345
- the heart 317
- toxin-induced cardiomyopathy 147

root cause - vitamin C depletion 252, 253

treatment protocols
- chelation 433
- hydrogen peroxide 387, 388, 391
- magnesium 257
- niacinamide 340
- ozone 393
- testing markers 401
- vitamin C 345, 442
- vitamin C and hydrocortisone 378

triggers
- chronic immune response 188, 189, 191, 194

Inflammatory bowel disease > *See under DISEASES and MEDICAL CONDITIONS, Crohn's disease*

influenza
as systemic infection 44

preventive and curative therapies
- hydrogen peroxide 389
- inhalation medicine 396, 398
- methylene blue 365, 378

symptoms compared to person with low cortisol levels 259

**Diseases and Medical Conditions —** *continued...*


insulin resistance
reduced by
- magnesium supplementation 244, 249, 312
related to
- dementia 213
- estrogen 243
- testosterone 244
intestinal fibrosis 48, 103
Irritable bowel syndrome 48, 103
kidney disease
linked to
- cavitational osteonecrosis 64
- chronic apical periodontitis (CAP) 53
- increased ceruloplasmin and copper 91
- low CoQ10 levels 178
- periodontitis 50
relationship to
- vitamin C 299, 303
treated with
- IV vitamin C 303
leaky gut
and celiac sprue 104
pathological association with
- abnormal microbiome 45, 47
- chronic pathogen colonization (CPC) 374, 396, 406
- iron 98, 103
- oxidative damage from toxins 103, 405
- pellegra 342
- persistent spike protein (PSP) 125
- poor digestion 106, 107
promotes
- chronic disease 36, 104, 375
- food allergies 104
toxins generated by 46
treatment considerations 439


**Diseases and Medical Conditions —** eaky gut *continued...*


- nebulization with hydrogen peroxide 133, 392, 413
menopause 75
metabolic syndrome 50, 243
neurodegenerative diseases 48, 180
NEUROLOGICAL DISEASES
Alzheimer's disease 48, 50, 82, 91, 103, 178, 206, 213, 312, 340, 341
autism 48, 421
bipolar disorder 48, 50, 103
brain abscess 48, 50, 103
dementia 48, 50, 103, 211, 212, 213, 218, 219, 220, 341, 342, 355, 437, 439, 440
depression 48, 103
- Depression 48, 312, 355
linked to
- periodontitis 50, 52
migraine 48, 50, 103, 312
Migraine 48
multiple sclerosis 48, 50, 64, 91, 103, 206, 312
Neurological disease 50, 52
Parkinson's disease 48, 50, 82, 103, 178, 206, 340, 341
seizure 48, 50, 103, 319, 320, 323, 328
Seizures 312
stroke 48, 312
osteoporosis
calcium supplementation
- contraindicated 83
fracture is not most significant danger for patients 84
is not a calcium deficiency disease 83
promoted by
- periodontitis 50
reason calcium should not be supplemented 447

**Diseases and Medical Conditions —** osteoporosis *continued...*

relationship to
- calcium 447
- oxidation 447

treatment protocols
- decrease oxidative stress 444
- list of supplements 444, 445

PERSISTENT SPIKE PROTEIN (PSP) SYNDROME
1 of 3 primary toxin sources 39
continuing presence of spike protein 122
diversity of presentation 118
likelihood of developing 124
prevalence of 116
relationship to
- COVID-19 and COVID vaccinations 155
- COVID injections 114
- COVID vaccinations 124
- the heart 161

treatment protocols 115, 400, 401, 402
- bio-oxidative therapies 136

underdiagnosed 122
when PSP manifests 122

poliomyelitis (polio)
relationship to intracellular biomolecule oxidation (IBO) 41
treatment protocols
- magnesium 321
- ultraviolet blood irradiation (UBI) 395
- vitamin C 280, 321

Pre-eclampsia 311
PULMONARY DISEASES
adult respiratory distress syndrome (ARDS) 117
allergic rhinitis 50
ARDS 117, 355, 363
asthma 50, 266, 395, 397, 411

**Diseases and Medical Conditions —** Pulmonary Diseases *continued...*

chronic obstructive pulmonary disease 49
- COPD 48, 103

pneumonia 50, 227, 359, 398, 413
respiratory Infections 398, 400
- upper 399

rheumatic diseases 48, 103
schizophrenia
characterized by
- brain energy metabolism impaired by chronic inflammation 218
- chronic inflammation 344
- chronic oxidative stress in the brain 341
- increases in cytokines and other inflammatory markers 343
- low niacin blood levels and depressed cellular ATP levels 344
- microglia in the brain 343

linked to
- brain damage 343
- pellagra (niacin deficiency) 342

list of symptoms 341
niacin deficiency documented to be root pathology 179
treatment protocols
- highly dosed niacin 345, 346, 347, 348
- niacin and vitamin C 219
- vitamin C 345

sexual diseases and conditions 48, 103
erectile dysfunction 48, 103
infertility 48, 103
polycystic ovary syndrome 48, 103
pregnancy 48, 103

spike protein
associated with

**Diseases and Medical Conditions —**
spike protein *continued...*

- elevated D-dimer levels 171, 172
- Rouleaux formation in RBCs 131, 132, 141
- wide variety of diseases 118

linked to

- heart arrhythmias 167, 316
- myocarditis 156, 158, 160, 163, 318
- sudden death 318
- thrombosis 118

properties of

- ability to persist for years 432
- binds to ACE2 receptors 116, 117, 118, 128, 130, 170
- can settle in most bodily tissues 124
- considered one of most potent toxins 117
- elevated troponin levels at risk to receive vaccine 158
- enveloped in exosomes 119, 120
- fragment of COVID-19 virus 114
- higher levels in those receiving the vaccine 318
- its ability to replicate 432
- mortality rates 159
- one of three main toxin sources 39
- pathophysiology 127, 128
- physiology 115
- present in numerous tissues and organs 126
- prevalence 116
- provokes persistent inflammation 419
- targets the heart 161, 162, 164, 317
- targets the heart (list of damaging mechanisms) 155

treatment protocols

- bio-oxidative therapies 136, 141

**Diseases and Medical Conditions —**
spike protein *continued...*

- ivermectin, hydrochloroquine, and chloroquine 135
- methylene blue 364
- need to monitor clinical and laboratory abnormalities 373
- oxygen-ozone autohemotherapy 393
- ozone 394
- proteolytic enzymes (bromelain, N-acetyl cysteine, nattokinase) 402
- quercetin 135
- variety of agents 127
- various agents 137, 138
- vitamin C 134, 281

vaccine and booster shots

- create ongoing replication 114
- increase presence 125
- potentially worsen heart function 156, 158

when present from bout of COVID-19 or vaccine does not resolve

- called persistent spike protein (PCP) syndrome 114, 115

why it persists 122, 123

tetanus 35, 41, 280

throat infection

chronic pathogen colonization (CPC) 45, 106, 392, 396, 404, 407, 418, 438

initiated by COVID 398

seeded by chronic pathogen colonization (CPC) 400

treatment protocols

- inhalation medicine - probably only effective way 396
- nebulization 399, 411
- nebulization with hydrogen peroxide 133, 373, 378, 388, 389, 390
- nebulization with hydrogen peroxide and vitamin C 327
- ozone gas insufflation 69

**Diseases and Medical Conditions —** throat infections *continued...*

throat infections
chronic pathogen colonization (CPC) 36
thyroid disease 48, 50
tonsillar infections
as chronic pathogen colonization (CPC) 70, 400, 404, 407, 413
- primary toxin source 432
as focal infection 45, 49
characteristics of focal infection and chronic pathogen colonization (CPC) 65
connected to venous and lymphatic drainage 427
linked to
- coronary heart disease 429
often asymptomatic 68, 414
often covered with biofilms 65
seeded by infected teeth and/or gums 68, 69, 418
treatment protocols 63, 70, 438
- for cancer patients 209
- list of 69
- list of agents 69
- list of four ways to treat 414
- methylene blue 70
- ozone gas injections 414
worse impact than dental infections 68
β-thalassemia 150

**disinfectant** 59, 369, 384, 385, 391
disinfectant agents 59

## E

**ectopy, atrial** > *See under DISEASES and MEDICAL CONDITIONS, CARDIOVASCULAR DISEASES*
**ectopy, ventricular** > *See under DISEASES and MEDICAL CONDITIONS, CARDIOVASCULAR DISEASES*
**ejection fraction (EF)** > *See under DIAGNOSTIC TESTS*
**electrocardiogram (ECG)** 157, 164, 314, 316 > *See under DIAGNOSTIC TESTS*
**electron-depleted state** 30, 32, 84 > *See also REDOX-BIOLOGY, oxidized*
**electrons**
distribution by antioxidants 224, 226, 253, 322, 354, 356, 357
helpful analogy 354
methylene blue 364, 369, 370
phagocytes help supply 387
radiation depletes from biomolecules 282
redox biology, toxins and pro-oxidants 29, 32, 33
relationship to
dehydroascorbic acid (DHAA) 228
- direct marker of depletion 228
electron transfer chain (ETC) 174, 180
Fenton reaction 85, 86, 264
ORAC test 232
redox biology 29, 198
toxins
- neutralized by new electrons 261
- steal and retain 356, 357
- stealing is essence of all disease 37
vitamin C can donate two 233, 276
restore function to biomolecules 265
source of new 224, 229, 231, 356
reduced antioxidant supplements are not significant source of new 225
status 31
vital role of electron flow 223

**encephalitis** > *See under DISEASES and MEDICAL CONDITIONS*
**endodontists** > *See under Dentists*

**endotoxins** > *See under TOXINS & POISONS*
**energy flow** 29
**energy homeostasis** 47
**enzymes**
and detox 296
are biomolecules 30, 198
associated with biosynthesis of vitamin C 260
digestive 106
GSH synthesizing 238
iron-containing 93
need for normal transmembrane voltages 356
relationship to
leaky gut syndrome 406
testing endotoxins and exotoxins from root canal-treated teeth 57, 58
the spike protein 115, 134, 402
salivary 107
supplemental 107

**epigenetic defect**
evidence of defect shown with supplementation that allows synthesis of vitamin C 218
in the complete translation of the messenger RNA coding for the enzyme L-gulonolactone oxidase (GULO) 260, 263
most humans have 255
overcome by hydroxytyrosol 294, 383, 438, 439
prevents normal synthesis of vitamin C in the liver 378, 454
results in excess of glucose 217
unclear what normal glucose levels would be 217

**Epstein-Barr** > *See under DISEASES and MEDICAL CONDITIONS*

**essential vitamins (A, C, D, E, K, B1, B2, B3, B5, B6, B7, B9, B12)** 333
all-cause mortality 333

**excess oxidative stress** 30, 31
**exotoxin** > *See under TOXINS & POISONS*
**external toxin exposures** > *See under TOXINS & POISONS*
**extracellular**
agents taken into cytoplasm 288
calcium 80
debris 202
disease manifestation 37
exchange of electrons in 356
fluid 51, 121
free iron 93
hormones 241
hydrogen peroxide 86, 386
as a signaling molecule 388
generated by phagocytes 387
generated by vitamin C 387
lymph 121, 201
magnesium 323
oxidative stress 199, 201, 208
polysaccharides 45
spike protein 122
toxin neutralization 294
vesicles 119, 120
vitamin C 190, 247, 253, 256, 257, 259, 263, 271, 283, 294, 307, 383
and glucose 438

**eye diseases and disorders** > *See under DISEASES and MEDICAL CONDITIONS*

## F

**ferritin** > *See DIAGNOSTIC TESTS, ferritin blood test*
as an inflammation marker 93

**ferritin —**
*continued...*

as fuel for Fenton reaction 87
description of 93
levels lowered by calcium channel blockers 76
levels never too low 88
lowered by calcium channel blockers 76
lowering levels increases longevity 76
purpose of 93
structure of molecule 93

**ferritin blood test** > *See under DIAGNOSTIC TESTS*
**ferritin levels** > *See under Diagnostic Tests, ferritin blood test*
**focal infections**
common sites 45, 49
elimination of 42
identifying 70, 197
in the gut 104
metastatic-like spread 245, 429
non-oral 427
oral 45, 189, 203, 403, 426, 432, 438
pathogen presentations 44
relationship to chronic disease 436
relationship to hormones 429, 430
seeding coronary arteries 195, 427
seeding CPC 209
source of relevant toxins 199
unaddressed 187

**food allergies** > *See under DISEASES and MEDICAL CONDITIONS (non-dental)*
**food combinations** 36, 105, 108, 109
**food putrefaction** 46, 71, 107, 109
**fungi** 47, 53, 185, 186, 205, 384, 409, 476

## G

**G6PD (glucose-6-phosphate dehydrogenase) deficiency** > *See under DISEASES and MEDICAL CONDITIONS (non-dental)*
**gallbladder** 45
**gastrointestinal tract** 43, 47, 99, 105
**generalized infectious disease** 44
**gingiva** > *See under Dental Structures*
**gingivitis** > *See under DENTAL INFECTIONS and CONDITIONS*
**glucose**
biosynthesis into vitamin C 217, 255, 261, 263, 401, 437, 438, 439, 454
epigenetic defect prevents 214, 216, 217
process described 261
control in diabetes 211, 212, 213, 438
excess in blood
inhibits vitamin C uptake into cells 438
low blood levels
permit vitamin C uptake into cells 289
primary role of 217, 438
relationship to
CoQ10 178
cortisol 215, 216
estrogen 243
multi-gram doses of vitamin C 288
oxidative stress 217
steroids and gluconeogenesis 215, 216, 257, 258, 260, 262, 263, 307
vitamin C transport into cells 212, 232, 249
structure similar to vitamin C 288
falsely high glucometer readings possible 288
membrane transporters can passively move vitamin C into cells 276

**glucose —**
structure similar to VC *continued...*

pancreas perceives vitamin C as glucose, releases insulin 288

**glucose-6-phosphate dehydrogenase (G6PD) deficiency**
description 304
fortifying blood against hemolysis 305
guidelines for
methylene blue administration 368
vitamin C administration 304, 305, 306, 368
relationship to
oxidative stress 304, 305
safe supplements 304

**gold** > *See under HEAVY METAL ACCUMULATION*
**gums** > *See under Dental Structures*
**gut lining health** 47

## H

**Haley, Boyd, PhD** 57, 58, 422
**healthy teeth** 58
**heart disease** > *See under DISEASES and MEDICAL CONDITIONS, CARDIOVASCULAR DISEASES*
**heart failure** > *See under DISEASES and MEDICAL CONDITIONS, CARDIOVASCULAR DISEASES*
**HEAVY METAL ACCUMULATION**
1 of 3 primary toxin sources 39
cardiomyopathy treatment protocols 419, 420, 422
chelation should be standard-of-care 421
especially mercury and antimony 421
CHELATION
agents

**Heavy Metal Accumulation —**
Chelaation *continued...*

- deferoxamine 422
- dimercaprol 154, 422
- DMPS (dimercaptopropanesulfonate) 420, 422, 423
- DMSA (dimercaptosuccinic acid) 420, 421, 422, 423
- EDTA (ethylenediaminetetraacetic acid) 148, 420, 422
- NBMI 422, 423
- penicillamine 422
- prescription 137, 420
- prophylactic nutrient 420
- trientine 148, 422

chemotherapy 155
copper 148
effectiveness confirmation - hair testing 422
for PSP sufferers 163
- use heavy metal chelators 163

iron 44, 150
mercury 421, 423
need for 36, 70, 421, 422, 425, 432
- heavy metal accumulations 175, 419
- to reduce oxidative stress 433

heavy metals
chelation agents > *See under chelation*
- should be part of optimal treatment protocols 36

list of 147
- aluminum 35, 147, 153
- arsenic 35, 100, 154, 421
- cadmium 35, 147, 154, 421, 423
- chromium 35, 147, 151, 153, 154, 285
- copper > *See under TOXINS and POISONS, nutrients*
- gold 147, 151, 154, 423

**Heavy Metal Accumulation —**
heavy metals *continued*..
- iron > *See under TOXINS and POISONS, nutrients*
- lead 35, 100, 147, 148, 149, 151, 152, 421, 423, 433
- mercury 35, 36, 100, 147, 149, 151, 152, 153, 154, 415, 420, 421, 423, 433
- nickel 35, 151, 152
- silver 147, 154
- spike protein 163 > *See also PERSISTENT SPIKE PROTEIN (PSP) SYNDROME*
- thallium 35, 154

optimal treatment protocols
- chelation required 137

properties of
- contribute to pathogen accumulations in heart, brain, and other organs 46
- taken up by the heart 152, 182, 317, 420
- toxicity from contributing factor in heart failure 149

relationship to
- heart failure 147
- often culprit in IDCM 151, 155
- spike protein 317
- viral myocarditis 154

in organs and tissues 36

often unsuspected 151

refusal to acknowledge 182

relationship to
ATP-depleted state of the heart 181, 419
chronic disease 36
chronic viral myocarditis 152
congestive or hypertrophic cardiomyopathy 168
IDCM 152
poorly contracting heart 181

**herpes** > *See under DISEASES and MEDICAL CONDITIONS*

**Herxheimer, Karl, MD** 295

**Herxheimer reaction** > *See under DISEASES and MEDICAL CONDITIONS*

**high blood pressure** > *See under DISEASES and MEDICAL CONDITIONS, CARDIOVASCULAR DISEASES*

**high metabolic activity** 46, 317

**Hoffer, Dr. Abram** 91, 346, 347

**HORMONES**
cortisol
description and properties
- abnormally low circulating levels 268, 271
- compared synthetic corticosteroids: prednisone and dexamethasone 247, 254, 270, 271
- deficiency contributes to excess intracellular calcium 448
- deficiency: many have abhormally low circulating levels 270
- deficiency: promotes disease 36
- deficiency: symptoms of low levels 259
- has some calcium channel blocking ability 254
- higher levels increase vitamin C uptake 268
- impaired ability to produce underlies many therapeutic failures 379
- impaired without sufficient vitamin C over-production can “burn out” the adrenal glands 262
- increased production no benefit if majority of receptors are oxidized 266
- increased production when infection present 267
- increased production when majority of receptors are oxidized 266
- induces production of glucose, contributing to excess 263

**Hormones —**
cortisol *continued...*
- levels already elevated in advanced sepsis 267
- normal levels help keep focal infections localized 429
- one of five critical hormones for impacting cellular oxidative status 241
- physiology 216, 257
- potent anti-inflammatory effect 259
- primary role and function: to increase vitamin C in inflamed or infected cells 248, 255, 257, 259, 274, 376
- produced in presence of infection 259
- released in response to increased circulating oxidative stress 214
- safety considerations 270
- synergism with vitamin C 247, 253, 259, 260, 265, 266

function in those with liver that biosynthesizes vitamin C from glucose 261, 262

relationship to
- burned tissues 247
- catabolism (muscle wasting) 258
- chemotherapy 215
- hydrocortisone 245, 246
- other glucocorticoids and muscle atrophy 215
- pathogen presentations 46

treatment protocols
- considerations in relation to vitamin C administration 258
- dosing considerations 268
- dosing recommendations 272
- need to address deficiencies 37
- need to diagnose deficiencies 71
- need to test for baseline levels 271, 381

**Hormones —**
cortisol *continued...*
- normalization important part of cancer protocol 434
- normalizing levels with vitamin C 248
- supplementation considerations 380, 381

cortisol receptors
become more oxidized as infections progress 267
number increased in sepsis 266, 267
oxidized
- advanced sepsis causes large percentage in body to be nonfunctional 266
- cannot optimize cellular vitamin C uptake 265
- reactivated by vitamin C 265, 267, 268
- reactivation requires large amounts of vitamin C 266
- require vitamin C for reactivation 266
- unable to bind cortisol when oxidized 266

estrogen 36, 75, 82, 241, 242, 243, 244, 434, 444
all-cause mortality 241, 445

hormone deficiencies 36, 37, 71, 244, 434

sex hormones 82

sex, thyroid, and cortisol
deficiencies
- increase intracellular calcium levels 448
- must be addressed in optimal protocols 37, 71, 429
- promote increased oxidative stress 46

play critical roles in intracellular health 250, 376

testosterone 36, 75, 82, 241, 243, 244, 272, 434
all-cause mortality 446

**Hormones —**
*continued...*

thyroid hormone 36, 37, 46, 71, 244, 245, 250, 259, 270, 376, 429, 430

**Huggins Diagnostic Center** 61
**Huggins, Hal, DDS, MS** 25, 427
**Hunninghake, Ron, MD** 278, 279
**Hydroxychloroquine (HCQ)** > *See under antiparasitics*
**hydroxytyrosol**
boosts vitamin C levels 263, 264, 425
human study 264
in olive leaf extract 138, 434, 439, 454
overcomes epigenetic defect 134, 383

**Hyperbaric oxygen therapy (HBOT)** > *See under BIO-OXIDATIVE THERAPIES*

## I

**Idiopathic pulmonary fibrosis** > *See under DISEASES and MEDICAL CONDITIONS, CARDIOVASCULAR DISEASES*
**immune function** 47, 48, 209, 251, 407
**immune support** 56, 133
**immune system**
chronically activated in presence of IBO 251
faulting reasoning concerning vitamin C and transplant patients 307
impact of tonsillectomy on 67
optimizing 251
with combined administration of vitamin C and hydrocortisone 382
prevented access by root canal treatment 56, 59

**immune system —**
*continued...*

primary role 183, 251, 252, 274
relationship to
allergies 406
atherosclerosis 190
radiation therapy 434
vitamin C
- immune cells uptake more in presence of cortisol 261
- requirement for 281
- undermined by absence of VC in combination with steroids 263

response hindered by lack of vitamin C at inflammation sites 256
response to leaky gut 406
role of tonsils 67, 68
strengthened by bio-oxidative therapies 433
strengthened by magnesium 320
supports roles of vitamin C and HP 378
& the mRNA COVID vaccine 119
triggered by inflammation 158, 189

**increased intracellular oxidative stress (IOS)** > *See OXIDATIVE STRESS (increased or excess)*
**infected and toxic gut** > *See under DISEASES and MEDICAL CONDITIONS*
**infected teeth** > *See under DENTAL DISEASES AND CONDITIONS*
**infected tonsils** > *See under DISEASES and MEDICAL CONDITIONS*
**Infections** > *See under DENTAL INFECTIONS and CONDITIONS; See under DISEASES and MEDICAL CONDITIONS*
and cortisol receptors 267
as promoters of chronic disease 36
body's elegant response to 261

**infections —**
*continued...*

immune prevention of 67
primary source of toxins 432
treatment
protocols must be followed until eradication of 290

**inflammation**
focal
equated to focal scurvy 252
in the brain
- encephalitis 343
- schizophrenia 219, 341, 343, 344, 345
in the heart 317
in the kidneys 340
instigated by
calcium intake 448
chronic pathogen colonization (CPC) 201
- produces bodywide 207
- produces continuous 206
heavy metal accumulation 422
iron 103
oxidative damage 257
pathogens 257
- dental 49, 51, 52, 53
- tonsillar 64, 68, 70
spike protein 130, 131, 157, 158, 160, 161, 163, 164, 165, 401, 419
markers of
cortisol levels 216
C-reactive protein levels 51, 53, 69, 131, 172, 177, 409, 414, 442
ferritin blood test 51, 53, 69, 76, 93, 95, 96, 131, 150, 172, 177, 409, 414, 442
oxidative balance score (OBS) 303
vitamin C - focal deficiency as primary identifying factor 188, 253, 255, 256

**inflammation —**
markers of *continued...*

mitigated by
agents that restore depleted vitamin C 246
chelation 433
cortisol 248
- released in response to 255
flow of electrons to biomolecules 253
magnesium 257
monocytes and phagocytes first to appear at sites of 188, 256, 378
ozone therapy 393
platelets as part of initial response to 189
vitamin C 442
- no alleviation unless depleted VC restored 246
- perfect treatment for 345
- required to resolve 189, 194, 345
properties of
activates phagocyte activity 387
characteristic of all disease 442
equated to oxidative stress 303, 307
immune response always seeks to resolve 252
primary role
- how it accomplishes 257
- real reason for 252
provokes increased HP production 387, 388, 391
underlying pathology of any disease 184
relationship to
breast cancer 202
coronary artery disease 184, 189, 194
dermatitis 338
heart failure 145, 146, 147, 156, 157, 158, 161, 163, 168
steroids 247

**inflammatory bone diseases** > *See under DISEASES and MEDICAL CONDITIONS*

**Inflammatory Bowel Disease** > *See Crohn's Disease*

**Inflammatory bowel disease (Crohn's disease)** > *See under DISEASES and MEDICAL CONDITIONS*

**influenza** > *See under DISEASES and MEDICAL CONDITIONS (non-dental)*

**Insulin**
- conserves magnesium 249
- highly underutilized 248
- one of most powerful healing agents 248
- positively impacts
  - ATP synthesis 249
  - bodywide oxidative stress 241
  - cellular uptake of many agents 288
  - glutathione levels 249
  - levels of calcium, magnesium, vitamin C, glutathione, and ATP 249
  - magnesium uptake into cells 249
  - mitochondrial function 249
  - permeability of the blood-brain barrier 288
  - uptake of vitamin C into cells 249
- potentiation therapy (IPT) 288
- resistance
  - related to decreased intracellular magnesium 249

**intestinal fibrosis** > *See under DISEASES and MEDICAL CONDITIONS*

**intoxication** 34, 133, 235, 249, 250

**intracellular**
- ATP
  - optimal levels critical for health 334
  - Super 8 Supplements keep levels high 454

**intracellular —** *continued...*
- calcium 77, 78, 82
  - and IV magnesium (caveat) 319
  - excess levels present in all diseases 75, 77, 309, 311, 447
  - increases IBO 236, 239
  - levels increase as hormone levels decrease 75
  - levels inversely proportionate to magnesium levels 310
  - lowered by calcium channel blockers 319
  - lowered by testosterone 243
  - lowered with hydrocortisone 248
  - lowering levels improves longevity 76
  - lowering levels with magnesium 309, 311
  - reducing levels goal of any therapy 77
  - Super 8 Supplements maintain low levels 454
  - supplements needed to keep low levels 450
  - transmembrane transport into cell blocked by magnesium 319
  - vitamin C, magnesium, vitamin D3, vitamin K2 work together to lower 424
- calcium and magnesium
  - impacted by thyroid hormone 245
- calcium-binding proteins 78
- cortisol receptors
  - function depends upon redox status 265
  - vitamin C uptake enhanced with cortisol binds to 247
  - when oxidized, aggressive measures to normalize intracellular vitamin C levels must be taken 266
- delivery of various agents
  - enhanced by insulin 289

**intracellular —**
*continued...*

ferritin 93
free iron 93
G6PD 304
glutathione 238
works to control IBO levels 240
health 77
critical role of hormones 376
involves critical hormone roles 250
requires normal intracellular levels of calium, magnesium, vitamin C, glutathione, and ATP 249
hydrogen peroxide
interacts with vitamin C to kill pathogens 377
iron
reducing levels improves longevity 76
iron and copper 85
list of major players in determining oxidative stress 235
magnesium
ability to normalize intracellular oxidation 320
and the heart 314, 315
as determined by Holter monitor 316
levels almost always low 322, 323
low levels and impact on heart 170
low levels of Mg and potassium cofactors for arrhythmia provocation 315
maintaining optimal levels 323, 324, 325, 326, 327
measuring
- in monocytes, lymphocytes, and platelets 324
- usually low, even when serum tests are normal 313

**intracellular—**
magnesium *continued...*

- with sublingual epithelial assay 323
mitochondrial magnesium 327
organelles 37, 119, 232, 391
mitochondria sites of ATP production 173
pathogens
eliminated by MB and PDT 364
spike protein 123
toxins
impact on ATP production 240
released by IV vitamin C 296
released by mop-up IVC 384
vitamin C 214, 218
aggressive measures to normalize levels must be taken 267, 437
all disease characterized by insufficient levels 274
delivery into cells enhanced by
- cortisol/hydrocortisone 254, 274, 379
- insulin, hydrocorisone and magnesium 294
- lipsosme-encapsulation 285, 286, 294, 383
- magnesium 383
depleted by chronic synthetic corticosteroid therapy 271
depletion in diabetics 211, 212
highest in monocytes 256
increased levels upregulate Fenton reaction 264
low levels in diabetic patients 437
low levels result in less cortiol release 248
maintaining normal levels primary role of cortisol 255
optimization
- goal of optimal protocols 283, 381
- ways to achieve 258

**intracellular—**
vitamin C *continued...*
relationship to cortisol 214
relationship with cortisol 216
required to be normal for healthy cells 256, 382
when levels normal, no disease can exist 274
vitamin C and glutathione
normalized by estrogen 241
vitamin C and magnesium
are low when calcium is high 237
zinc
increased by zinc ionophores 135

**intracellular biomolecule oxidation (IBO)** > *See OXIDATIVE STRESS (increased or excess)*
excess
basis of all disease 42, 76, 213, 235, 242, 251, 252
negatively impacts
- ATP synthesis 239
- normal biomolecule function 337
made worse by
pathogens 41
toxins 199
vitamin C depletion 218, 252
normalization returns cell to healthy state 42, 236
normalized by
antioxidants 239
glutathione 238, 239, 240
hormones 241
intracellular vitamin C 237, 248
lowering intracellular calcium 236
lower intracellular calcium levels 248
magnesium supplementation 248
optimal protocols 376
relationship to

**IBO—**
excess *continued...*
cancer 197, 236
cell death 236
estrogen 243
intracellular calcium 236, 243

**intracellular oxidative stress (IOS)** > *See also intracellular biomolecule oxidation (IBO)*
description of 337
basis of all disease 320
only destroys pathogens when sufficiently high 377
optimized by
intravenous vitamin C 305
Super 8 supplements 454
origin of 431
relationship to
calcium supplementation 441
cancer 431
cancer treatment 91
Fenton reaction 85
intracellular calcium 76, 77, 78, 285, 309
intracellular toxins 296
pathogens 41
schizophrenia 343
vitamin C and cortisol 268

**ionophores** 135

**iron** > *See under Toxins and Poisons, toxic nutrients*

**iron deficiency anemia** > *See under DISEASES and MEDICAL CONDITIONS*

**Issels, Josef, MD** 67
Josef Issels 67, 68

**ivermectin** > *See under antiparasitics*

## J

**Jarisch, Adolf, MD** 295

**jawbone** > *See under Dental Structures*

## K

**kidney disease** > *See under DISEASES and MEDICAL CONDITIONS*

**kidneys**
- MB protects from chemotherapy damage 357
- relationship to
  - Co!Q10 175
  - hemolysis 306
  - iron and copper 112
  - magnesium, estrogen, and insulin 242, 249
  - vitamin C 87, 218, 258, 269
- site for focal infections 45

**Klenner, Frederick, MD** 277, 278, 285, 287, 289, 308

## L

**lead** > *See under HEAVY METAL ACCUMULATION*

**leaf extracts**
- list of with anti-cancer, anti-inflammatory, immune-stimulating, antitoxin, antioxidant, antihyperglycemic, and anti-pathogen properties 230, 231
- olive leaf extract 138, 263, 294, 401, 454

**leaky gut** > *See under DISEASES and MEDICAL CONDITIONS*

**Leu, Fabrice, ND** 138, 139, 140

**leukemia** > *See under DISEASES and MEDICAL CONDITIONS, cancer*

**liver disease** > *See under Diseases and Medical Conditions*

**longevity**
- -related genes in women 242
- related to
  - all-cause mortality 91

**longevity—**
related to *continued...*
- lowering calcium and ferritin levels 76
- methylene blue used in cancer treatment 366
- toxicity of copper 92

**lymph**
- back-up in breast cancer patients causing arm swelling 203
- description of 201
  - system 202
- filtered by lymph nodes 203
- flow in lymphatic vessels 201
  - and then into venous blood 202
- incompletely digested food
  - draining into
    - intestinal 405
- infected teeth and gums draining into 68
- microbe/toxin laden
  - draining into
    - the breasts 208, 435, 436
    - the breasts and then armpits 203
    - the breasts (of men) 435
  - excreted by
    - chewing 51, 52, 57
    - tonsils 68
- must be treated when dealing with chronic pathogen colonization (CPC) 403
- spike protein-filled exosomes entering into 121
- spike protein in 122

**lymphatic drainage/flow**
- characteristics of
  - can be slowed, stopped, or even reversed by inflammation 202
  - carries toxins and pathogens that ultimately promote disease in the body 47

**lymphatic drainage/flow—**
characteristics of *continued...*
diminishing pathways promote accumulation of lymph 203
impairment caused by inflammation 202
incompletely processed food into from the intestines 406
oral microbes contained in 205
patterns in men and women 435
slowing promotes pockets of accumulation 435
from the teeth and jawbone 51
into
breast tissues
- source of 202
the thyroid gland 430
the tonsils 68

**lymphatic system**
description of 201, 202
drains the gums, deep gum tissue, and the teeth 203
extensive circulation in breasts 202
infected teeth, gums, and tonsils have most impact 428
primary role
- to provide outlet for cellular waste products, excess water, and toxins 201
toxins released into during detoxification 296
properties of
incompletely digested foods enter into from intestines 103
spike protein-containing exosomes enter into 121

**lymphatic tissue**
in breast cancer, pathogens collect and grow in 208
in Waldeyer's ring 66

**lymphatic vessels**
properties of
limited ability to contract 202
rich network in mouth, neck, chest, and breasts 203

**lymph nodes**
cancer-laden that drain the breasts 203
description 201, 202
infected tonsils draining into 68
invaded by spike protein 126
in Waldeyer's outer ring 67
related to
cancer 366
some consider tonsils to be 65

**lymphocytes** 68, 202, 324
**lyposome-encapsulated** 286

## M

**magnesium** > *See under Baseline Supplements*
**malignant cells** 44, 75, 77, 200
**medical practitioner** 38
**memory** 48, 341, 355
**menopause** > *See under DISEASES and MEDICAL CONDITIONS*
**mercury** > *See under HEAVY METAL ACCUMULATION*
**mercury fillings** > *See mercury amalgam fillings*
**Metabolic syndrome** > *See under DISEASES and MEDICAL CONDITIONS*
**metadichol®** 134, 138, 401, 425, 434, 439, 454
**methanol** > *See under TOXINS & POISONS, drugs*
**microbes**
characteristics of
determination of whether pathogen, innocuous, or even beneficial 42
estimated population in human body 47

**microbes—**
characteristics of *continued...*
include bacteria, viruses, and fungi 205
none are always pathogens 42
non-pathogenic 58, 205
- in the breast 205
found in
the breast 205
the mouth 205, 409
the tonsils 68
tooth root tips 56
probiotic 408
staining of
with methylene blue 355

**microbial ecosystem** 47
**microbial organ** 47
**microbiome**
abnormal (pathogen-ridden)
many conditions linked to 46
- list of 47
with leaky gut 104, 374
- ensures perpetual sickness 375
"microbial organ" 47
negatively impacted by
antibiotics 49, 407
chronic pathogen colonization (CPC) 396, 408
food putrefaction 107
ingestion of toxins 405
iron ingestion 103, 374
niacin deficiency 342, 343
pathogens 343
poor eating 108
slow-moving food in intestines from adverse food combining 108
normal or near-normal
described 47
very synergistic with any treatment protocol 413

**microbiome—**
normal or near normal *continued...*
positively impacted by
cessation of feeding with new toxins and pro-oxidants 404
hydrogen peroxide 133
nebulization 412
normal digestion 106
probiotics 408
regular tongue hygiene 413
relationship to
leaky gut 106
pathogen presentations 45

**microorganisms** 42, 43, 47
**microscopic examinations** 58
**migraine** > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*
**mouth contamination** 58
**mucosal surface** 45
**Mucositis from chemotherapy and/or radiotherapy** 48
**multiple sclerosis** > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*
**Mushroom** 35

## N

**necrosis (death)**
related to
cancer cells 431
- and intracellular calcium 77
Fenton reaction 85
intracellular iron accumulation 44
liver cells 115
pathogens 408

**necrotic bone** 58
**nervous system diseases** 48, 440
**neurobehavioral development** 47

**neurodegenerative diseases** > *See under DISEASES and MEDICAL CONDITIONS*

**Neurological diseases** > *See under DISEASES and MEDICAL CONDITIONS*

**Neurological/Psychiatric Disesases** > *See Alzheimer's Disease, Parkinson's Disease, and Dementia*

**niacin** > *See under BASELINE SUPPLEMENTS*

**niacinamide** > *See under BASELINE SUPPLEMENTS, niacin*

**nickel** > *See under HEAVY METAL ACCUMULATION*

**nicotinamide adenine dinucleotide (NAD)**
- biosynthesis
  - support major part of protocol for dementia 213, 218
- deficiency of
  - prevalence 336
  - result in declines in cellular function 334
- relationship to
  - Alzheimer's disease and Parkinson's disease 340
  - atherosclerosis 337
  - cancer 338
  - cardiomyopathy 179, 337
  - electron transfer chain (ETC) and ATP production 174, 179, 218, 334
    - CoQ10 biosynthesis 339
  - heart muscle 337
  - infection protection and resolution 340
- supplements that help maintain high levels of
  - diet alone cannot supply sufficient niacin 336
  - list of 179, 218, 334, 335
  - methylene blue 181
  - niacin 218, 336, 346

**NAD—** supplements that help *continued...*
- niacinamide 425
  - dosing considerations 338
- niacin vitamers 338
- vitamin C 439

**Nicotine** 35

**nose**
- normal flora in 413
- related to
  - chronic pathogen colonization (CPC) in 45, 106, 327, 373, 404, 418, 438
  - intracellular biomolecule oxidation (IBO) in 41
  - nebulization 133, 378, 388, 390, 392, 396, 398
  - nebulization with runny 399
  - ozone insufflation treatments 69
  - removal of palatine tonsils to relieve obstructed breathing 66
- runny
  - symptomatic of tubular tonsillar tissue hypertrophy 66

**nutrient(s)**
- antioxidants
  - rich in electrons 229
- calcium > *See under TOXINS and POISONS, nutrients*
  - relationship to
    - osteoporosis 447
  - supplementation
    - should never be supplemented and dietary intake limited 74, 79
    - value of sour cream, heavy cream, and butter 449
- CoQ10 > *See under BASELINE SUPPLEMENTS*
  - vital antioxidant 177
- from food

**nutrient(s)—**
from food *continued...*

quality of digestion most important factor 108, 109
iron
supplementation
- extreme cautions needed > *See under TOXINS and POISONS, nutrients*
magnesium > *See under BASELINE SUPPLEMENTS*
most critical nutrient/electrolyte 237
supplementation
- recommendation 322, 325
minerals
many can be taken to excess 330
relationship to
assimilation with high metabolic activity of the heart 317
long-term brain disorders 344
reducing oxidized biomolecules 275
sick cells 356
source 102
selenium
supplementation
- caution because can be toxic 153
some are toxic 73
list 46
supplementation
assimilation may be greatly enhanced when taken an hour before vitamin C infusion 289
generally benefits continue to increase as doses are increased 329
needed because content in food continues to decrease 322
need for regular dosing due to excretion 88
vitamin C
- protects against muscle wasting 216
total food pulverization (TFP)
may help address unknown deficiencies 111
treatment protocols
cancer
- nutrient triad 348
chelators and toxin mobilizers 423
nebulization of 411
nutrient chelation should be part of any therapeutic spike protein protocol 163
requirement for balanced, nutrient-rich diet 37
supplementation
- cancer 434
- impact on heart health 158
- mitochondrial ATP production 425
- prophylactic chelation agents 420
- to eliminate deficiencies 348, 375
supplement optimally 70
vitamin B3 (niacin or niacinamide) > *See under BASELINE SUPPLEMENTS, niacin/niacinamide (vitamin B3)*
deficiencies can lead to other significant nutrient and micronutrient deficiencies 340
should never be denied to patient with brain disorder 347
vitamin C > *See under BASELINE SUPPLEMENTS*
deficiency has most powerful negative impact on health and survival 254
safest of all known supplements 330

**nutrient transport** 33

## O

**olive leaf extract** > *See under leaf extracts*
**organelles** 37
**orthodontic** 58
**Osteoporosis Protocol**
essential fatty acids 445
estrogen 445
magnesium 444
testosterone 445
thyroid hormone 446
all-cause mortality 446
vitamin D 445
vitamin K 444

**oxidation** > *See REDOX (reduction-oxidation)*
**OXIDATIVE STRESS (increased or excess)**
bio-oxidative therapies
increase within pathogens 377
cause of 31
excess toxicity, inadequate antioxidation, and decreased electron availability 431
mechanism of action 337, 356
definition of increased biomolecule oxidation (IBO) and increased intracellular oxidative stress (IOS) 41
markers of
C-reactive protein levels 177, 409
elevated creatine levels 303
elevated ferritin levels 94
low CoQ10 levels 177
oxidative balance score (OBS) 303
reverse T3 430
modulators of
antioxidants 223, 226
- dehydroascorbic acid (DHAA) 223, 226, 228

**Oxidative Stress —** modulators of *continued...*
- GSH 238
- methlyene blue 228
- methylene blue 180, 181
- vitamin C 87, 228, 253, 275, 276, 308
- vitamin K2 229

ATP 174, 180
electron transfer chain (ETC) 364
fueling the electron transfer chain 174
hormones 241, 429
- corticosteroids (synthetic) 247
- cortisol/hydrocortisone 245, 246, 248
- estrogen 241, 242, 243
- list of 241
- testosterone 243, 244
- thyroid 244

hydrogen peroxide and magnesium 189
Krebs cycle 364
magnesium 237, 320
methylene blue 362
promoters of
calcium
- ingested 285
- intracellular 77, 78, 82, 309

chronic pathogen colonization (CPC) 188, 197, 257
deficiencies of
- G6PD 304, 305, 306
- hormones 46
- magnesium 312

focal infections 429
heavy metals
- chemotherapy 77, 91
- copper 87, 89, 90
- copper and iron 84
- dietary copper 89
- dietary iron 88, 94, 97, 103
- iron 88, 92, 105, 150

**Oxidative Stress —**
promoters of *continued...*

- iron (free) 44, 93, 95
- list of 147
iron-added foods 374
list of 35
low CoQ10 levels 178
nutrient deficiencies 375
pathogens 189
- infections 264
- periodontal infections 51, 52
spike protein 115, 128, 159, 432
toxins 77, 82, 427
vitamin C depletion 188, 252, 253

reactive oxygen species (ROS)
as part of cytokine storm 363
generated during ATP production 364, 365
hydrogen peroxide (in waiting) 386
list of synonyms 31

relationship to
advanced sepsis 266
atherosclerosis 194
ATP synthesis 239, 240
biosynthesis of vitamin C in the liver 261, 262
blood clots 130, 131
breakdown of vitamin C to oxalate 302
cancer 194, 197, 200, 431
cardiomyopathies 145, 146, 150, 159, 173, 174
cell health 33
cortisol 214, 217, 254, 270
cortisol production 381
dementia 218
disease 29, 38, 76, 199, 207, 252, 320
- kidney 303
- not cause, the essence of 31, 42

**Oxidative Stress —**
relationship to *continued...*

Fenton reaction 85, 92
gut conditions 104, 105
health 33
immune system 251, 252
immunosuppressive drugs 307
inflammation 252, 256, 303
large stores of intracellular toxins 296
low cortisol levels 268
mitochondrial dysfunction 173
neuroinflammation 354
osteoporosis 442
pathogens 44, 46
schizophrenia 343
sodium-dependent vitamin C transporters (SVCTs) 255
steroids 307
toxins 214

results of
impairs normal metabolic function 30
makes any condition worse 44

treatment protocols 38
all should involve regular dosing of chelating agents to decrease 433
chelation agents (list of) 422
intravenous vitamin C 299
methylene blue 363
NBMI (N,N'bis-(2-mercaptoethyl) isophthalamide) 423
osteoporosis 444
phlebotomy 94
vitamin C 379
vitamin C, magnesium, vitamin D3, vitamin K2 425

**oxidized**
antioxidants
become reduced by grabbing new electrons supplied by diet 223, 224
depleted of electrons 33
equally stable with reduced antioxidants 356
how measured by ORAC test 231
incorrectly assumed to be
- ineffective and/or toxic 228
never resist being re-reduced 356
shown to be equally effective as when in reduced state 225
shown to be of great benefit in critically-ill COVID-19 patients 226
still highly effective at distributing electrons 354
biomolecules
damaged by radiation 282
determine disease 34
- via four listed parameters 37
diseased 31
electron depleted 30, 32, 33
inactivated 275
in unique arrangement, define disease 303
never receive electrons from saturated toxins 356
optimizing reduction 432
oxidized by
- copper and iron 84
- intracellular calcium concentration 236
- pathogens 43
- spike protein 115
reduced by antioxidants 275
- vitamin C 276
regain normal function when lost electrons regained 198
repaired by antioxidants 224

**oxidized —**
biomolecules *continued...*
wholly or partially loses normal chemical, biological function 198
coenzyme Q10
part of Complex II of electron transport chain (ETC) 174
superior in cardioprotective effects 229
cortisol receptors 267
nonfunctional; unable to bind cortisol 266
reduced by
- vitamin C 265, 267, 268
enzymes
in inactive state
- have impaired capability 296
GSH-synthesizing enzymes
can be reactivated (reduced) 238
caused by increased oxidative stress 238
methylene blue
exhibits equal clinical impact to reduced methylene blue 354
shown to have enormous benefit 226
pathogen metabolism byproducts 42
create new toxin exposure 208
tissues
require vitamin C to heal 247
vitamin C (DHAA) 275
equally effective as reduced vitamin C 223
minimizes brain infarct size 354
shown to be equally effective to reduce vitamin C 225
vitamin C (DHAA) and methylene blue
comparable to reduced forms in their clinical impact 353
cross blood-brain barrier 357
vitamin K2

as effective as reduced vitamin K2 229

**oxidized state** 30

**oxidizing agents** 31, 35

**oxygen**

along with hydrogen

most common in biological systems 388

and water byproducts of hydrogen peroxide metabolism 387

atom gain or loss another way of viewing REDOX biology 30

blood levels

increased by 1% to 3% by hydrogen peroxide nebulization 388

increased by administration of IV methylene blue 359

increased by hyperbaric oxygen therapy (HBOT) 395

increased by ozone and hydrogen peroxide 393

carrying capacity critically depleted by methemoglobinemia 355

delivery to tissues reduced by toxins 358

deprived bacteria form potent toxins 58

electrons donated to by cytochrome c 364

hydrogen peroxide effective storage form 387

intake is utlized in generation of hydrogen peroxide 385

low blood levels (hypoxia)

at peak exercise or high altitude

- increase risk of catastrophic arrhythmia 168

from COVID infection 117

ozone considered dioxide of hydrogen 392

radical absorption capacity (ORAC test) 231

relationship to

hydrogen peroxide 388

**oxygen —**

relationship to *continued...*

the terminal electron acceptor in production of ATP 174, 180, 364

transport impaired by Rouleau formation 131

treatment protocols

hypoxia treated with vitamin C, resulting in increase in ATP production 239

low blood levels increased by administration of IV methylene blue 227

oxygen-ozone autohemotherapy 393

**ozone** > *See under BIO-OXIDATIVE THERAPIES*

## P

**pancreatic cancer**

under DISEASES and MEDICAL CONDITIONS, cancer

cancer > *See under DENTAL INFECTIONS and CONDITIONS*

**paraquat** > *See under TOXINS and POISONS, chemicals*

**parasites** 43

**Parkinson's disease** > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*

**pathogens**

accumulations 44, 413, 435

description and properties

avid consumers of iron 86

cause increased IBO or IOS 42

covered by biofilms (CPC) 45, 407, 411, 412

death releases free iron 44

definition 42

difference between pathogen and microbe 42

**pathogens —**
properties *continued...*
different sources will ultimately promote same diseases 47
killed via the Fenton reaction 85
list of pathogen presentations 44
mechanism of death 265, 377
- Fenton reaction 264
no microbe is absolutely and always a pathogen 42
primary sources of new toxin production 42, 203, 208, 376, 404
die-off/Herxheimer reaction
agents and methods
- mop-up IV vitamin C 295
immune response to 257
oral pathogens 542, 575, 580
parasites, physically large pathogens 43
proliferation 43, 137
relationship to
bodywide inflammation 207
schizophrenia 343
response to biosynthesis of vitamin C 261
treatment protocols (anti-pathogen)
agents and methods
- bio-oxidative therapies 377
- hydrogen peroxide (HP) 384, 386, 387, 388, 389, 390, 391, 392
- hyperbaric oxygen therapy (HBOT) 395
- magnesium 320, 321, 327
- methylene blue 355, 363, 364, 365
- nebulization 396, 398, 399, 400, 411
- ozone 392, 393, 416, 417
- photodynamic therapy (PDT) 363
- probiotics 408
- tongue hygiene 408, 410

**pathogens —**
treatment protocols *continued...*
- ultraviolet blood irradiation (UBI) 394, 395
- vitamin C 295, 297, 377
- vitamin C and Fenton reaction 378
cancer 433
chronic pathogen colonization (CPC) 403
COVID-19 133, 134, 135
die off/Herxheimer reaction 295, 384
how to provoke the Fenton reaction 86, 87
ozone 293
persistent spike protein (PSP) 137
removal of seeding sites 209
type and/or location 396
abdominal aortic aneurysms 207
abnormal microbiome 45, 46, 103, 104, 107, 108, 109, 408
ACE2 binding sites
- COVID-19 117, 127
anaerobic bacteria 409, 476
- Clostridium botulinum 58
arterial wall 207, 427, 428
arthritic joints 207
blood clots 207
bloodstream and lymphatic system 428
brain tissue 342
- Parkinson's disease 206
brain tissue and cerebrospinal fluid
- Alzheimer's disease 206
- amyotrophic lateral aclerosis (ALS) 206
- multiple sclerosis 206
cancer 197, 199, 201
- breast 205, 206
- list of 207
cavitational 61, 62

**pathogens —**
type and/or location *continued...*
chronic pathogen colonization (CPC) 257
- assures continuous ingestion of waste byproducts 405
- ineffectiveness of antibiotics 407
- oral 413, 427, 432
- persistence of 406
- protected by biofilms 45
- relationship to ingested toxins 405
- seeding infections throughout body 396, 408
colonizations 36, 403
- need to identify and resolve 36
coronary arteries
- atherosclerosis 185, 186, 189, 190, 191, 193
COVID-19 118, 123, 432
- heart failure 155
dental surgical site 476
focal infections 49
Fusobacterium nucleatum 205
gut and breast tumors 205
heart mitochondria
- heart failure 175
intracranial aneurysms 207
iron-gathering (siderophores) 43
leaky gut 46, 47, 103, 104, 106, 413, 439
low hormone levels exacerbate impact 46
low-pressure venous side of circulation 428
lung tissues
- COVID-19 117
lyme disease 281
microbiome 342, 374, 375
oral 49, 52, 205, 208, 413, 428, 436
- in cancerous breast tissue 208
- linked to breast cancer 413

**pathogens —**
CPC *continued...*
- seeding infection elsewhere in the body 428
- tongue 409, 410, 411
oral and gut 206
overgrown microbiome 36
pericardial fluid 207
periodontal
- from root canal-treated teeth 204
periodontitis 50, 51, 206
placenta 207
root canal extraction sites 58
root canal-treated teeth 51, 52, 53, 56, 57, 58
target cells
- COVID-19 115
tonsils 65, 68
tuberculosis 281
Waldeyer's ring 67
waste products
oxidized, toxic 42, 43
- impact 43

**Pathogens, Dental/Oral**
DNA
found in
- breast cancer tissues > *See also* ***Fusobacterium***
linked to
colon cancer > *See also* ***Fusobacterium***

**pathology**
blood-clotting
determined by D-dimer testing 129, 130, 171, 172
caused by
chronically infected teeth 57
excess biomolecule oxidation 235, 252, 275
- comprises all disease 31, 403
excess copper 149

**pathology —**
caused by *continued...*

heavy metal accumulation 152
infected teeth
- determined by cone-beam computed topography (CBCT) 54
iron and copper 88
niacin deficiency 179, 342
spike protein 130, 165, 181, 318
- need to be determined by clinician 419
cellular 404
determinants of 37
in suddenly prolonged PR intervals 165
need for complete understanding of 375
of breast
due to toxin exposure 201
of myocarditis
demonstrated by troponin levels 171
relationship to
excess biomolecule oxidation 75, 199, 201
inflammation 184
intracellular and extracellular oxidative stress 201
intracellular vitamin C levels 216, 255
pharmaceutical agents 175, 351
treatment goals 375
treatment protocols 127
common cold
- with vitamin C 281
determined by microbiological cultures 476
goal of 143
hypertrophic cardiomyopathy
- with CoQ10 177
with vitamin C 308

**pathophysiological** 47, 184

**Pauling, Linus, PhD** 90, 278, 351

**periodontal ligament** > *See under DENTAL STRUCTURES*

**periodontal pathogens** 186 > *See also DENTAL INFECTIONS and CONDITIONS, periodontitis*

**periodontitis** > *See under DENTAL INFECTIONS and CONDITIONS*

**PERSISTENT SPIKE PROTEIN (PSP) SYNDROME** > *See under persistent spike protein (PSP) syndrome*

**pesticides** > *See under TOXINS and POISONS, chemicals*

**phencyclidine "PCP"** > *See under TOXINS and POISONS, drugs*

**physiological**
actions of hormones 271
center of tooth described 56
certainty of infection in tooth with pulp removed 59
circumstances of calcium deposition 80
damage from excessive supplementation of some mineral nutrients 330
effects of
subclinical hypothyroidism 244
vitamin C 266
goal of
heart failure treatment 175
the electron transport chain 347
impact of spike protein 114
interactions of the microbiome with rest of the body 47
interplay between mouth and rest of the body 185
levels of intracellular biomolecule oxidation (IBO
maintained at normal 76, 201, 238, 240
remains normal 85
restored to normal 42, 236, 250, 352, 376

**physiological —**
levels *continued...*
nature of myocardial muscle cells 160
role played by
COVID vaccine 116
tonsils 65
state of focal inflammation synonymous focal deficiency of vitamin C 188

**pneumonia** > *See under Diseases and Medical Conditions, Pulmonary Diseases*

**poisoning**
from
aluminum-containing pesticide 153
iron-enriched food 104, 375
lead 147, 148
gut microbiome with CPC toxins and iron-added food 404, 406
negative impacts of 34
treated in emergency room or poison control center 34
vitamin C as effective antitoxin 34

**poisons** > *See under TOXINS & POISONS*

**poliomyelitis/polio** > *See under DISEASES and MEDICAL CONDITIONS*

**Polycystic ovary syndrome** 48, 51 > *See under Disease*

**polysaccharides** 45

**preclampsia** > *See under Diseases and Medical Conditions*

**Pregnancy, complications** > *See under Disease*

**prescription antibiotics** 45, 396

**PR intervals** > *See under Diagnostic Tests*

**pro-oxidant(s)**
action of
chemotherapeutic agents 215, 293
chronic pathogen colonization (CPC) 187
excess intracellular calcium 82
Fenton reaction 87, 391
free iron 93, 208
hydrogen peroxide 133, 386, 393
hydroxyl radical 387
ozone 392
spike protein 128
stress 260
toxins 201, 281
agents and vitamin C administration 293, 382
cause all diseases 405
challenge every person 322
damage mitigated by vitamin C 382
equated to toxins 341
exposure
goal to identify and minimize impact 42
generated by ATP-making process 365
immunosuppressive drugs 307
in the environment 336
involved in cytokine storm 363
list of synonyms 31
neutralized by
antioxidants and new electrons 356
methylene blue 363
vitamin C 282, 304
ozone's effect on pathogens 293
pathogen presence always source of 427
presence of low antioxidant presence is origin of disease 199
produced by infection 320

**pro-oxidants —**
produced by infection *continued...*
rupture G6PD-deficient RBCs 304, 305
"steal" electrons 33
synonymous with toxin 32
toxins and clinical impact 356
treatment goal to neutralize 404

**prostate** 45, 50, 80
**protocols**
all require significant antioxidant/ anti-toxin impact 373
cancer 197, 433
cardiomyopathy and coronary heart disease 419, 421, 430
coronary artery disease (CAD) 194, 426
COVID-19 139
dental surgery 469
estrogen replacement 242
general principles 36, 38, 40
hydrogen peroxide nebulization 391
inhalation medicine
COVID-19 396
methylene blue 353, 361
osteoporosis 449
persistent spike protein 122, 127, 140
magnesium 318
tooth extraction
biological 417
ultraviolet blood irradiation 377
vitamin C therapies 278, 279, 382

**protozoa** 47, 56, 186, 409
**pulp** > *See under Dental Structures*
**putrefaction of food** 36

## Q

**quercetin** > *See under zinc ionophores*

## R

**radiation** 35, 282
**radiolucencies** 57
**reactive oxygen species (ROS)**
> *See under OXIDATIVE STRESS (increased or excess)*
**Reactive Oxygen Species (ROS)**
31 > *See under Oxidative Stress*
**REDOX (reduction-oxidation)**
biology
and electron flow 29, 30, 356
ATP physiology and cardiomyopathy 173
based on concept that all biological health is due to the degree of reduction versus oxidation 199
definition of 29
vitamin C example of 32
oxidation
always impedes biological function 30
definition 29, 30
definition of REDOX chemistry 29
excessive level is disease 199
linked to
- maintaining REDOX balance 198, 199, 233
names for intracellular 41
of biomolecules
- determine nature of disease processes 37
- does not impart any further ill-defined disease or abnormal condition 38
- is disease 31, 38
relationship to
- all disease 35, 37, 38, 54, 102
- antioxidants 225
- ATP physiology 173
- cancer 208
- cardiomyopathy 173
- cellular pathology 201
- chemotherapy 91

**REDOX —**
oxidation *continued...*
- cytokine storm 117
- diabetes and dementia 211
- diseased tissues 255
- electron transfer chain (ETC) 174
- Fenton reaction 85
- infections 267
- intracellular calcium 76, 77
- osteoporosis 447
- pathology 199
- toxins 31, 39, 356

treatment protocols
- atherosclerosis 426
- bio-oxidative therapies 376
- chronic pathogen colonization (CPC) 403
- magnesium 320
- methylene blue 356
- reducing oxidized biomolecules 376

oxidized 29, 30
principles 224
reduction 29, 30, 31, 86, 96, 173, 176, 199, 224, 233, 268, 311, 356, 426, 432, 436
definition 29
related to
atherosclerosis 426
toxins 198

**reduced biochemical status** 42
**reducing agents** > *See also antioxidants*
**reduction** > *See under REDOX (reduction biology) BIOLOGY*
**rheumatic diseases** 49
**Riordan Clinic** 270, 278, 298, 299
**Riordan, Hugh, MD** 278
**root tip** > *See under Dental Structures*
**Rouleaux formation** 131, 132, 141, 394

## S

**scientific literature**
regarding
concept of oxidative stress 29
CoQ10 177
effectiveness of vitamin C as antitoxin 34
immune system 252
microorganisms in the microbiome 47
pathology created by dental procedures 416
power of oxidized antioxidants 225
primary pathophysiology of disease tied to oxidative stress 199
relationship between toxins and chronic disease 32
synonyms for oxidizing agents 31
ubiquitous presence of infection in root canal-treated teeth 59

**seizures** > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*
**siderophores** 43
**silver** > *See under TOXINS & POISONS heavy metals*
**socket** > *See under Dental Structures*
**spike protein** > *See PERSISTENT SPIKE PROTEIN (PSP) SYNDROME*
**Stone, Irwin, PhD** 278, 312
**stroke** > *See under DISEASES and MEDICAL CONDITIONS, NEUROLOGICAL DISEASES*
**strychnine** > *See under TOXINS and POISONS, chemicals*
**Super 8 supplements**
baseline protocol 453
baselkne protocol 136
goal of
to optimize/normalize intracellular oxidative stress 454

**Super 8 supplements —** goal of *continued...*

recommendation concerning
chelation agents 137
recommendations concerning
cancer 434
cardiomyopathies 425
dementia 439
other supplements 454

**systemic**
administration of anti-pathogenic agents via nebulization 411
application of insulin 249
bodywide effects from dental procedures 470
diseases
associated with abnormal microbiome 106
dissemination of infection 475
infection 44
inflammation
associated with cavitational osteonecrosis 64
inflammation and circulating toxins
related to catastrophic arrhythmia 168
lupus erythematosus patients 207
oxidation associated with worsening infection 267
oxidative stress
approaching death (sepsis) 266
associated with simultaneous administration of vitamin C and copper 87
managed with intravenous vitamin C 306
seen in cancer 131
versus localized 286
vitamin C deficiency (scurvy) 184

## T

**testosterone** > *See under Protocol Hormones*
**tetanus** > *See under DISEASES and MEDICAL CONDITIONS*
**throat**
IBO in mucous membranes 41
location of tonsils 65, 66
location of Waldeyer's ring 66
promoting normal flora 413

**throat infection** > *See under DISEASES and MEDICAL CONDITIONS*
**thyroid disease** > *See under DISEASES and MEDICAL CONDITIONS (non-dental)*
**tonsils**
description and properties 65
connected to lymphatic flow 68
connection to immune system 67
excretion organs 68
location and function 66
swollen palatine tonsils can obstruct breathing 66
tonsillectomy and adenoidectomy 66
tonsillectomy and impact on the immune system 67
purpose of 68

**toxic environment** 46, 324
**TOXINS and POISONS**
carbon monoxide 34, 35
chemicals
acetaldehyde 34
amphetamine 34
benzene 35
carbon monoxide 34
cyanide 35
methanol 35
paraquat 35
pesticides 35

**Toxins and Poisons —**
chemicals *continued...*

strychnine 35
chemotherapy 112, 147, 148, 149
drugs
Acetaminophen 34
alcohol 34, 168, 230, 264, 314, 369
Amphetamine 34
barbiturates 34
Barbiturates 34
Cocaine 34
phencyclidine (PCP) 35
endotoxins 43, 58, 187
exotoxins 43, 58, 187
botulinum toxin 58
exposures 34, 35, 39, 40, 42, 46, 70, 112, 201, 208, 211, 259, 282, 283, 287, 317, 322, 375, 403
external 36
nutrients
calcium
- all-cause mortality 79, 81, 83, 236, 237, 291, 442, 450
- amount of excess determines the sickness of a cell 237
- as antacid 291, 450
- avoid excess dietary intake 81, 112, 173, 235, 330, 374, 449
- common denominator for several diseases 79
- danger of excess intake 74, 75
- intracellular level primary determinant of oxidative stress 236
- mechanisms of lowering - treatment protocols 77, 78, 237, 241, 243, 245, 248, 249, 309, 311, 319, 320, 376, 422, 423, 424, 442, 450, 453, 454
- morbidity and mortality 84
- myths about 82, 83
- never supplement 76, 84, 112, 291, 303, 319, 374, 441, 443, 447, 449

**Toxins and Poisons —**
nutrients *continued...*

- one of three major toxic nutrients 36, 46, 96
- primary cause of kidney stones 269, 300, 301, 303
- primary cause of oxidative stress 76
- relationship to cancer 81
- relationship to cardiac death 80
- relationship to coronary artery calcium (CAC) score 80, 81
- suggestions for intake 441, 446
- supplementation alone does not strengthen osteoporotic bone 442
- supplementation does not prevent fractures 448

copper
- all-cause mortality 92
- and iron toxic twins 84
- deficiencies do not exist 92
- inability of body to use in metallic form 97
- mechanisms of lowering - treatment protocols 89, 90, 148, 149, 154, 422
- never supplement 92, 330, 374
- one of three toxic nutrients 73
- relationship to oxidative stress 87, 92
- relationship to various diseases 36, 46, 87, 88, 90, 91, 96, 147, 148, 149, 151, 152, 155
- relationship to vitamin C 89

iron
- all-cause mortality 96
- danger of metallic forms 405
- dietary intake cautions 73, 99, 105, 106, 374, 449
- mechanisms of lowering - treatment protocols 36, 44, 76, 86, 93, 94, 96, 149, 150, 153
- must adults suffer with excess 150

**Toxins and Poisons —**
nutrients *continued...*

- one of three toxic nutrients 46, 330
- overload relationship to vitamin C 303
- poisoning of our food 375
- relationship to gluten-free foods 105
- relationship to "leaky gut" and food allergies 96, 97, 98, 99, 100, 101, 102, 103, 104, 406
- relationship to oxidative stress 84, 92, 95
- relationship to various diseases 36, 43, 44, 90, 95, 147, 149, 150, 187, 208, 296, 297
- supplementation cautions 88

poisons 34, 287, 320

toxin leakage 58

toxins

accumulation in

- in the heart (mostly heavy metals) 317
- organs increase diseased state 318
- the heart 155, 175

cause of

- abnormal microbiome 396, 404
- all disease 35, 207, 320, 404
- both forms of cardiomyopathy 145
- disease through oxidation of biomolecules 405
- leaky gut 405
- oxidative stress 77, 433

description and properties

- access to body through leaky gut 413
- all are pro-oxidant 32
- can be distributed by the blood and lymphatic system 47
- chemical characteristics determine clinical presentation of disease 199

**Toxins and Poisons —**
toxins *continued...*

- compromise the immune system 251
- damage intestinal cells 405
- die-off/Herxheimer's reaction from release at cell death 384
- difference between nutrients and toxins 74
- different sources of toxins can promote the same disease 47
- disease presentation determined by organs/tissues targeted by 41
- etiology of ALL disease 32
- infection-generating 433
- inflict their damage by stealing electrons from biomolecules 33, 37
- lymohatic system's purpose is to provide outlet for 201
- neutralized by cortisol 246
- neutralized by GSH 238, 240
- pass through leaky gut 104
- released by stress 260
- retention of electrons impedes electron flow 356
- seeded from chronic pathogen colonization (CPC) 408
- spike protein one of most potent 116
- vitamin C is an antitoxin 276, 283
- vitamin C is perfect antidote 281

diagnosing through

- hair testing 422

enormous number of pure 432, 433

identifying sources of new 375

relationship to

- arrhythmias 314
- atherosclerosis 187
- biosynthesized vitamin C 261
- breast cancer 200
- cancer 197, 201
- catastrophic arrhythmia 168

**Toxins and Poisons —**
toxins *continued...*
- coronary artery disease 190
- heart failure 147, 155, 163
- myocarditis 152
- Schizophrenia 341

source of
- bacteria-generated 109
- cavitational osteonecrosis 61
- chronically ingested from diet and oral infections 133
- chronic pathogen colonization (CPC) 201
- chronic pathogen colonization (CPC) in oral cavity cause leaky gut 405
- dental pathogens 54, 64, 416
- dietary 215
- endotoxins and exotoxins produced by pathogens 43
- exotoxins (from anaerobic bacteria) 58
- focal infections 199
- food and water 404
- gut-generated 46, 109
- infected gums, teeth, and tonsils 51, 52, 428
- ingested pathogens 407
- iron 105
- lymphatic flow 435
- one of three main sources 39, 45
- oral infections most significant and clinically consequential 432
- pathogen-generated 46, 103, 203, 206, 208
- pathogens and parasites 43
- periodontitis 49, 50
- primary sources 432
- root canal-treated teeth 58, 204
- some plants 230
- swallowing oral chronic pathogen colonization (CPC) in the mouth 404

treatment protocols

**Toxins and Poisons —**
toxins *continued...*
- accelerated release of stored intracellular toxins 296
- basic principles 36
- bio-oxidative therapies 377
- chelation 422
- chronic pathogen colonization (CPC) 399, 403
- coronary artery disease 427
- elimination of accumulated toxins 376
- far-infrared sauna 424
- include excretion of through chelation or detoxification and/or neutralization 70
- magnesium 320, 321
- methylene blue 358
- multi-C 294
- need to chelate 432
- neutralized by vitamin C 134
- optimal approach 375
- vitamin C 297, 357
- vitamin C rate of administration 286

**traditional dentists** 59, 61
**transmembrane voltages** 33, 356
**treatment protocols**
all should involve regular dosing of toxin-mobilizing or chelating agents 433
cancer and differing pathophysiologies 197
COVID should include killing all pathogens in nasopharyngeal and upper respiratory tract 396
foundational principles 36, 38, 373
- based on orthomolecular principles 353

heavy metal chelation 421
incorporating vitamin C 279
open wound healing 194
persistent spike protein (PSP) 122
principles for constructing 433

**treatment protocols —**
principles *continued...*

refractory hypotension 361
UV blood irradiation (UBI)
for COVID and variety of other conditions 140

**troponin** > *See under DIANOSTIC TESTS, troponin level blood test*
**tubules** > *See under Dental Structures*

## U

**ultraviolet blood irradiation (UBI)** > *See under BIO-OXIDATIVE THERAPIES*
**University of Kentucky** 57, 422
**upper respiratory tract**
pathogens in 157, 396
relationship to
chronic pathogen colonization (CPC) 45, 407
inhalation medicine 396

## V

**vaccines** 113, 114, 125, 317
**Venoms** 35
**viruses**
located
at root tips of root canal-treated teeth 56
in abscessed teeth 53
in nose and throat 398
in the gut microbiome 47
on tongue 409
relationship to
atherosclerosis 185, 186
cancer 205
Waldeyer's ring 67
treatment protocols
metheylene blue 366
methylene blue 365

**viruses —**
treatment protocols *continued...*

nebulization 398
- hydrogen peroxide 384, 389, 391
ozone 394
UV light 140
vitamin C 279

**vitamin C** > *See under BIO-OXIDATIVE THERAPIES*
**Vitamin C** > *See under BASELINE SUPPLEMENTS*
**vitamin D3** > *See under BASELINE SUPPLEMENTS*
**vitamin K2** > *See BASELINE SUPPLEMENTS*
**vv** 35

## W

**Waldeyer's ring** 66, 67
**waste metabolites** 61
**West, Jason, DC, ND** 278

## X

**X-ray** > *See also 3D Cone Beam Imaging; See under DIAGNOSTIC TESTS*

## Y

**Yanagisawa, Atsuo, MD, PhD** 279

## Z

**zinc ionophores** 135
Chloroquine (CQ) > *See under antiparasitics*
Hydroxychloroquine (HCQ) > *See under antiparasitics*
ivermectin > *See under antiparasitics*
quercetin 135, 306

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## Chapter 2

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## Chapter 4

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## Chapter 5

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## Chapter 6

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## Chapter 8


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## Chapter 13

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## Chapter 14

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## Chapter 16

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